Curriculum and Competence: Exploring the relationship between competence development and the curriculum; a comprehensive case of two TVET institutions in South Africa.

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DECLARATION

Submitted in fulfilment / partial fulfilment of the requirements for the degree of

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University of KwaZulu-Natal, Pietermaritzburg, South Africa.

I, ……., declare that

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Acknowledgements

spes alit agricolas, spes sulcis credit aratis

semina, quae magno faenore reddat ager:

haec laqueo volucres, haec captat arundine pisces,

cum tenues hamos abdidit ante cibus:

spes etiam valida solatur compede vinctum;

crura sonant ferro, sed canit inter opus.

- Tibullus, Book II

Many thanks to all those who contributed to my journey thus far, both personally and professionally. I am hugely indebted to everyone for picking me up and spurring me on when I had lost hope and about to give up. I have gained and lost friends along the way, seen many places and made lots of memories. At this point I am both mentally & emotionally exhausted and it would be remiss of me to even attempt to quantify everyone's contribution individually. To family; thank you for putting up with the financial strain and the countless hours of me being away from home. To friends; I appreciate your continued presence in my life and keeping me sane when it felt like my mind was about to lose its grip on reality. To all the colleagues I have met along the way; thank you for making me feel at home wherever I have found myself in the world. Special mention goes to Volker Wedekind and Helen Brown. In all honesty this dissertation belongs to you guys! You guys saw potential in me from the beginning and invested in my development, without you I probably wouldn't have even continued with my studies let alone compile this dissertation. Volker thank you for all the hours you invested mentoring me and showing me the ropes, I am still not sure what you saw in me all those years ago. This is my small way of repaying you for the faith you have shown; I hope it suffices.

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Amen

Zolile Nicholas Zungu

Contents

Abstract

The term "skills development" has been debated in South Africa by government, labour and scholars for the last few years. A lot has been written about the country's shortage of skills in critical sectors such as mining and manufacturing. In response to these challenges the government has invested a lot of resources towards the development of policies that will facilitate the transfer of skills to the majority of South African citizens. The legislative and policy frameworks established in South Africa to facilitate skills development are quite clear on the mandate for institutions within the TVET sector. Historically TVET in South Africa has been viewed as a means to close the skills gap that exists within artisanal occupations and increase mass economic participation of previously disadvantaged individuals. However there remain significant challenges at the institutional level that make it difficult for a coordinated strategy to gain any traction in addressing the issue of skills development. The TVET system in South Africa is quite complex and has various components that fit quite intricately together. It is therefore critical to understand the TVET policy landscape and a significant portion of the discussion in this dissertation is focused on providing some insight into the various stakeholders. The intention is to understand how these various components interact within the TVET space and how this interaction affects the transfer of knowledge and skills to learners within the system. The discussions delve into the subject of how these various institutional components interact with each other within the TVET space and how this interaction affects the transfer of knowledge and skills to learners within South Africa's system. In order to gain greater insight into some of these institutional dynamics this study was designed to investigate issues around curriculum and competence. This study is broadly framed by the relationship between curriculum and competence; to be more specific, curriculum design and its influence on competence development. The study makes use of the findings from a COMET study conducted in South Africa in 2011. COMET is a form of Large Scale Competence Diagnostics tool in TVET and is one of the instruments that can be used for assuring and developing quality TVET curricula. Using COMET as a benchmark, the focus of the study was uncovering some of the factors which influence the development of holistic problem solving competence amongst apprentices and trainees who are at various stages of their training at different types of TVET institutions in South Africa. Through this study we have endeavoured to answer the following questions; 1) what are the patterns of achievement of trainee electricians in the COMET test in relation to their training institutions? 2) What influence does the curriculum have on the development of holistic competence?

Chapter 1

Introduction

The primary focus of this dissertation is the institutional dynamics of the Technical Vocational Education and Training (TVET) system in South Africa and how these dynamics shape the development of occupational competence of learners. The TVET system in South Africa is quite complex and has various components that fit quite intricately together. These components include the Sector Education and Training Authorities (SETAs), the Department of Higher Education and Training (DHET) as well as the various TVET institutions responsible for providing training. In essence within this study the intention is to understand how these various components interact within the TVET space and how this interaction affects the transfer of knowledge and skills to learners within the system. In order to do that I will make reference to the outcomes of the COMET Study which was conducted by the Manufacturing, Engineering and Related Services SETA (MerSETA) in partnership with a university from Germany that specialises in competence research and designing instruments that measure occupational competence. The focus of this particular study was measuring the development of holistic problem solving competence amongst apprentices and trainees at various stages of their training at different types of training institutions in South Africa. The details of the nature and findings of this study will be discussed in further chapters.

I was first drawn to the subject of TVET during a brief period where I interacted with TVET College instructors. I was working on a course offered by the University of KwaZulu-Natal (UKZN) to provide a teaching certificate to TVET College lecturers who had other professional qualifications besides a teaching qualification. Through my engagement with these lecturers I soon gathered that pedagogically TVET is more complex than it appears on the surface. It also does not help that generally across South African society TVET does not share parity of esteem with general or academic education and training; most of the learners within the system are regarded as having failed to make it in the more accepted academic system (UNESCO, 2012). This has resulted in the system being poorly understood by the general public, most research and funding is directed at strengthening the General Education and Training (GET) system. There was also the perspective of industry to consider and how companies interface with education and training issues.

Overall TVET in South Africa has been viewed over the years as a means to close the skills gap that exists within artisanal occupations and increase mass economic participation (McGrath & Akoojee, 2009). This is perhaps the reason why most of the TVET research to gain some prominence in South Africa is research that framed TVET and the education

system as a whole as a pipeline of potential skills for the economy. However there has been little research conducted on the dynamics of the TVET learning space (whether it be a workshop, studio or classroom). Thus from my interaction with the lecturers I worked with, I developed an interest for the interaction between the lecturers/instructors and their students in the classroom. On a broad level I was questioning whether TVET lecturers were equipped to perform their jobs adequately and efficiently.

Unlike their counterparts who teach in schools, TVET lecturers are most likely to be teaching without a professional teaching qualification. A significant number of those whom I interacted with come from an industry background and they only started teaching because they had no other work or they were looking for something less labour intensive; the others came from a teaching background with no industry experience. This presented an interesting dichotomy of teachers on the one side and artisans (and other industry people) on the other. From a pedagogy point of view it raised one question; which one of the two has the educational skills to effectively transfer skills and knowledge within a TVET system? For me the question was important because TVET is in essence a fusion of theory and practice in any particular subject matter. As such it is vital that special emphasis is given to the quality of practitioners who operate within this space. This experience was shortly followed by my introduction to the concept of competence that would change my view of TVET as a whole. It is important to note that when dealing with vocational education that one can never separate the theory from practice and vice versa; the concept of competence allows one to view the two as one. This point is explored in more detail in the literature review as well as the theory chapter.

This specific study falls within the wider discourse on skills development in South Africa, much of what takes place on the ground across various TVET teaching and learning spaces is informed by this national discourse. Thus it is crucial to provide a contextual overview of the discourse around skills and skills development in South Africa before going into the specifics of my research into the subject. It must be noted that the scope of topics covered under the banner of skills development is quite vast and my study will only be exploring issues related to competence and curriculum at the institutional level of TVET.

The term “skills development” has been debated in South Africa by labour and government for quite some time. A lot has been written about the shortage of skills in critical sectors such as mining and manufacturing, the government has invested a lot of resources towards the

development of policies that will facilitate the transfer of skills to the majority of South African citizens (Allais, 2011; McGrath & Akoojee, 2009; DOL, 2004).

The recent history of Technical Vocational Education and Training (TVET) in South Africa is closely linked to the development path followed by the country since 1994. In order for one to understand the significance of South Africa's preoccupation with skills, and more specifically skills development, one has to come to an understanding of the country's socioeconomic trajectory since 1994. In the period 1994 – 2012 South Africa has gone through four distinct macro-economic policy positions; Reconstruction and Development Programme (RDP), Growth Equity and Redistribution Policy (GEAR), Accelerated and Shared Growth Initiative South Africa (AsgiSA) and recently the National Development Plan (NDP) [DHET, 2011]. These policy "paradigms" have come to shape every aspect of South African life. For TVET the links to government's macro-economic strategy is mapped out in policies contained in documents such as the Human Resource Development Strategy (HRDS-SA), the National Skills Development Strategy (NSDS) and the National Development Plan (NDP). Policies outlined in these documents highlight the critical role of skills development in the government's bid to grow the South African economy and improve the standard of living of South Africans.

The South African economy is estimated to have achieved and sustained an average 3.4% growth rate in the years 1995 – 2005 (Van Der Weshuizen, 2012). This period coincided with a growth in individual income amongst individuals from previously disadvantaged communities and a decrease in the levels of absolute poverty by 5% as a result of increased access to the formal economy through the various Employment Equity (EE) policies implemented by the state (Van Der Weshuizen, 2012). One of the biggest contributing factors for the growth of the economy is the country's increasing participation in the global economy. The influx of direct foreign investment into South African enterprises was quite significant in reviving the South African economy (Du Plessis & Smit, 2007). This period of sustained economic growth created a bigger tax base than there has ever been in the country's history, allowing the government to invest more in social programmes (grants and services). Overall the South African economy has made significant gains over a short period of time. Besides an increased Gross Domestic Product (GDP), South Africa has become a focal point in regional and global politics (The Economist, 2012). However all the gains made by the economy have not come cheaply. From a skills point of view the increased economic activity created a great demand for skilled labour, which has not been met to date (Abedian, 2012).

The specific reasons as to why the country's skills base is in shortfall will be covered in more detail further on in this chapter. The South African economy has to a large extent been unable to translate its financial success into the socio-economic realm (Abedian, 2012).

For all its success economically South Africa continues to suffer from what has come to be termed the triple threat, that being the combination of poverty, inequality and unemployment. As stated above the South African economy has done considerably well to create economic wealth, however one of its greatest challenges lies in distributing that wealth amongst its citizens (Van Der Weshuizen, 2012; Abedian, 2012). Currently income across individuals and households in South Africa is distributed quite unevenly; according to the World Bank (2013) South Africa's GINI coefficient sits at 0.63, making it one of the most unequal societies within the international community. There has been rich debate within the literature in South Africa regarding the nature and extent of the triple threat (Hanival & Maia, 2010; Abedian, 2012; Van Der Weshuizen, 2012). Discussing the exact nature of that relationship is not the purpose at this point of the discussion; what is important to bear in mind is the fact that within the South African context it is imperative to consider any socio-economic intervention in terms of how it engages with this compound challenge (The Economist, 2012). Due to the direct and residual effects of apartheid policies a majority of South Africans continue to find themselves in situations where they have difficulties accessing social services such as education, health, housing as well as water and electricity. The challenge of accessing basic services is further compounded by the lack of employment opportunities. According to an article in *The Economist* (2012) youth unemployment was estimated at approximately 50% for 2011, Statistics South Africa (2015) reported the figure to have decreased marginally to approximately 48% by the end of the 4th quarter of 2014. It is thus estimated that a young person who does not find full-time employment by the age of 24 will not obtain any permanent employment in their lifetime (StatsSA, 2015). The rapid rise in the levels of unemployment in the country has meant that an increasing number of South Africans is dependent on social grants offered by the state, according to 2008 statistics the number is estimated at 10.5 million people (Reitzes, 2009). This is approximately a fifth of the South African population who are dependent on those who are economically active and contribute to the tax base (StatsSA, 2015). The implications of increasing unemployment levels are; a decreasing tax base, lower levels of production and ultimately a rise in the cost of living. It is for this reason that the issue of skills and employment occupies a central position within South Africa's policy discourse. It is worth noting also that as far as skills

development is concerned, from the government's perspective, it is about more than preparing an individual for the world of work but it forms part of a larger social justice imperative. All the thinking around skills development policies, strategies and evaluation takes place within the confines of this particular socio-economic reality. One of the aims of this thesis is to explore the dynamics of skills development at an institutional level and how those dynamics impact on the development of competence amongst learners.

There exists currently a significant body of literature in South Africa centred on the issue of skills; this includes the quantitative studies on skills "shortages" and employment, the impact of skills shortages on the economy, the socio-economic effects of skills as well as possible strategies to counter the effects of skills shortages (DHET, 2014; HSRC, 2012; ILO, 2012). One of the biggest contributing factors cited by early literature for the short supply of skills in the country is the "brain drain" of the late 90s (Butcher, 2008; McGrath & Akoojee, 2009, DOL, 2004). However this line of thinking does not provide an accurate account of the reality; indeed there has been an outflow of skills from South Africa over the last 15 years but that is normal for an economy that is operating at the level of the global market; skills flow in and out (Butcher, 2008). There are also structural factors that influence the distribution and acquisition of skills across the country. These will be expanded on further in the literature review chapter. The effects of the "brain drain" on South Africa's economy however cannot be undermined as these structural factors highlighted the gap that existed in the supply of skilled labour in the market (Butcher, 2008). At that particular point in time a majority of high level skills and resources were concentrated amongst a small portion of the population. This was a significant setback not only for an open economy but for development as a whole. In 1998 the government passed into legislation the Skills Development Act (SDA) [RSA, 1998]. The main objective of the act was to counteract the effects of the outflow of skills from the South African economy and job losses by prioritising the development of skills within the country. The SDA outlines six primary objectives for government with regards to the development of skills. These are listed as; (a) develop the skills of the workforce, (b) increase investment into education and training, (c) open up the workplace as a learning space, (d) encourage workers to participate in learning programmes, (e) improve the employment prospects for the previously disadvantaged and (f) to ensure quality education and training for the workforce (RSA, 1998). Further reading of the SDA reveals the challenge for the TVET sector; that challenge being the synchronisation of objectives and operations

between education and the labour market. The objectives of the SDA are operationalized within the targets of the NSDS which is currently in its third phase.

> "The National Skills Development Strategy (NSDS) is intended to radically transform education and training in South Africa by improving both the quality and quantity of training to support increased competitiveness of industry and improved quality of life for all South Africans." (DOL, 2004, pg 1)

This statement captures the purpose of skills development while at the same time it arguably outlines the challenges. In terms of purpose and principle the three NSDS cycles have been closely aligned to the macro-economic policy framework of their day; the benchmarks and indicators for each cycle closely linked to those of the macro-economic policy:

The first phase of the NSDS [or NSDS 1] (2001 – 2004) was underpinned by the mantra "Skills for productive citizenship for all" (DOL, 2004, pg 1); the primary objective for this phase was ensuring that individuals from previously disadvantaged backgrounds have access to education and training programmes, increasing the skills base and opening up the opportunity for lifelong learning. This phase of the NSDS was characterised by its political agenda for achieving equity in terms of the distribution of skills as well as creation of employment opportunities (DOL, 2004). This period is also remembered as the period when learnerships were introduced, in place of apprenticeships, in a bid to increase workplace exposure for learners at TVET institutions.

NSDS 2 (2005 – 2010) was introduced during a period when the South African economy was experiencing rapid growth and stabilisation. The growth of the skills base however was not growing at a rate that matched the growth of the economy. Under the broad mandate of AsgiSA of not only building on the indicators of the previous cycle, but to inflate targets and shorten delivery time frames. NSDS 2 also coincided with the introduction of the Joint Initiative on Priority Skills Acquisition (JIPSA).

> "Jipsa has attempted to translate the aggregate skills shortage in South Africa into a short-term operational plan, focused on a defined set of skills priorities. Its approach has been to generate the information required to define the skills shortages more closely, create the environment in which government departments can fast-track some of their own skills development plans and work more closely together, and to engage more effectively with the private sector and organised labour to increase the supply of priority skills." (Presidency, 2008, pg 9)

During this period there was also an increased focus on “critical skills” or “scarce skills”. There was increased incentives for Sector Education and Training Authorities (SETAs) embarking on short-term projects addressing specific skills challenges. Through JIPSA and NSDS 2 all institutions and organisations involved in the provision of occupation oriented education and training were incorporated into a single operational framework (DOL, 2005; Presidency, 2008).

NSDS 3 was launched in 2011 with significant changes having taken place in the country after the 2009 elections. The NSDS now formed part of the Department of Higher Education and Training (DHET). In his foreword to NSDS 3 the DHET Minister highlighted the gains made under the NSDS 1 and 2 frameworks, however he goes on to point out areas that remain a challenge for skills development. Under NSDS 3 the role of TVET institutions is brought to the fore as a broader range of approaches to developing skills are explored by the government. NSDS 3 is explicit in its aims to integrate awareness of the socio-economic reality of the country into training programmes (DHET, 2011). As far as the policy is drafted, it seems as if it has the potential to open up opportunities for partnerships amongst stakeholders operating in the TVET sector. The approach also seems to be more rounded as it calls for the development of numeracy and literacy in conjunction with occupation specific training. This is in contrast to its predecessors who did not indicate such explicitly, if at all (DHET, 2011).

The legislative and policy frameworks established in South Africa to facilitate skills development are quite clear on the mandate for institutions in the TVET sector. However there remain significant challenges at the institutional level that make it difficult for a coordinated strategy to gain any traction in addressing the issue of skills. In the White Paper for Post-School Education and Training [White Paper] (2014) the DHET cites the persisting structural gaps in the provision of TVET at an institutional level as a significant factor in the continued struggle to convert enrolment into skills and ultimately into jobs. A case of this can be seen in the number of different types of institutions and organisations that operate across South Africa’s TVET landscape. Due to the diverse number of approaches to training the sector has become quite fragmented with only a few pockets of quality and excellence. The quality and excellence in provision has become largely dependent on the existence of partnerships between institutions and industry (McGrath & Akoojee, 2009). In both the White Paper and NSDS 3 the recommendation has been made for increasing the prominence of Technical Vocational Education and Training (TVET) Colleges. This not only ensures

maximum coverage of all regions in terms of provision of training programmes; but also attracting more youth into vocational occupations. Over and above the diversity in the training provision there are also quite a number of statutory bodies in charge of various facets of the education and training process. The essence of my study is to investigate all these dynamics and explore how TVET differs across teaching and learning spaces and how these dynamics shape the development of occupational competence.

Background

In this section of the chapter I will be discussing the background of this specific thesis and providing a broad overview of how this study was conceptualised. This study came about as one of the outputs of my participation in the COMET study. As mentioned briefly earlier in this chapter, The COMET study was a joint project involving the MerSETA, a leading German university and a number of companies affiliated with MerSETA. COMET was commissioned by MerSETA as a means to add a qualitative mechanism to their artisan training programmes. Further details of the COMET methodology will be outlined in the methodology chapter.

The COMET study drew from participants from employer companies who form part of MerSETA's Accelerated Artisan Training Programme (AATP). The AATP was introduced as one of its flagship projects by MerSETA as a way of increasing the artisan training pipeline, in response to the call made by the Joint Initiative on Priority Skills Acquisition (JIPSA) to increase the rate and numbers of trained artisans. The JIPSA call took into account the demand created by the increased activity in infrastructure development, construction, engineering and manufacturing which was being hampered by the lack of an adequately trained workforce, an ageing artisan cohort and a lack of a co-ordinated strategy to develop the next generation of artisans. It was argued at the time that in order for South Africa to maintain the projected economic growth rates the country would have to produce about 12,500 artisans a year, from a base of 5,000 that were being produced on average annually as at 2006 (MerSETA, 2009a; Presidency, 2008).

The AATP was initially conceptualised in 2004 by the Steel and Engineering Industries Federation of South Africa (SEIFSA) and then expanded during 2005 using the services of the Resolve Group. The SEIFSA proposal was based on the experiences of member companies who had tested a more focused approach to the workplace experience component

of the apprenticeship. The project then migrated to MerSETA where it was developed further into a broader project management framework for the Metal and Motor sectors. In March 2007, the MerSETA board approved initial funding to test the possibilities of implementing the approach advocated by SEIFSA companies as part of a broader framework. The project was officially launched in June 2007 and the first grant was paid in November 2007. By September 2009, the programme had registered a total of 2,169 apprentices, of which 341 were from the motor trades and the remainder from the metals trades. In March 2012 the AATP completed phase 5 with an average completion rate across phases sitting above 75% (Underhill Corporate Solutions, 2012).

The AATP was initially intended to address the challenge of the increasing distance between TVET and industry as a result of the decline in the apprenticeship system which had an adverse effect on the skills needs of companies, forcing them to implement adaptive strategies in order to remain competitive (Underhill Corporate Solutions, 2012; Presidency, 2008). According to MerSETA's Sector Skills Plan [SSP] (2009a) the critical shortage of artisans in South Africa can be attributed to a number of causal factors, such as: the decline in the apprenticeship system since the early 1990s; the "deskilling" of artisan type work; the decline in the status of artisans; and the lack of revision of the apprenticeship schedules. The AATP is in essence one of the adaptive innovations implemented by industry aimed at not only addressing the immediate crisis but also laying the foundation for future cohorts of artisans to service industry in the long-term.

The breakdown of the apprenticeship system in the early 90s came about as a result of a shift from state control over artisan development to a market determined system which placed training in the hands of employers. According to the JIPSA report (Presidency, 2008) during the period 1990 – 1999 registration of new apprenticeships fell by 91% in the metal sector, 67% in the motor sector and 92% in the auto sector. The report goes on to highlight that due to the introduction of learnerships and increased government funding for the learnerships the rate did not rise until the late 2000s when JIPSA was implemented. These three sectors have been highlighted as they are the three biggest sub-sectors within MerSETA. This decline was further exacerbated by, firstly, the replacement of apprenticeships by learnerships through the Skills Development Act of 1998 and secondly, the expected demise of the apprenticeship system when the Manpower Act would be repealed by the Minister of Labour (DOL, 2004). There was also the issue of funding where the grants were awarded in favour of learnerships rather than apprenticeships. As a result of the breakdown of the apprenticeship system the

distance between TVET and the labour market was getting bigger at that particular point in time. The employer–provider (particularly TVET Colleges) relationship broke down and as a result substantial pedagogical gaps emerged within private training providers. The apprenticeship administration also fell into a state of disarray (MerSETA, 2009a).

By 2007 it was also acknowledged by the Department of Labour that there was a shortage of artisans in priority trades to meet the industry needs of the country and JIPSA targeted the development of 50,000 artisans (including 30,000 additional artisans to what would ordinarily be developed) by 2010 to meet the demand (Presidency, 2008). The AATP was established as a response within the metal and motor industries to this challenge. However, the AATP was being implemented at a time when investments in skills development were coming under increasing scrutiny in light of the global economic downturn around 2008 (MerSETA, 2009a).

There is currently concern within DHET about the post-school training environment which is described as being fragmented and not coordinated effectively. The White Paper (2014) lists some of the issues to consider as; the various sites of delivery, the range of approaches as well as the different regulatory and reporting requirements. Workplace learning, in particular, has operated with little monitoring or regulations and the structure and quality varies from employer to employer.

By the end of 2010 (phase three) the AATP had established itself as a credible brand amongst companies when it comes to artisan development. The programme was and continues to be endorsed by industry for its structure, support and results. A study conducted by Underhill Corporate Solutions [UCS] (2012) shows that at the end of phase three the programme was qualifying 79% of its intake of apprentices and learners; this was a significant increase from the 58% who qualified in phase one. However at this point there were questions being raised concerning the quality of the apprentices being trained on the programme? Employers were citing the fact that even after apprentices qualified on the AATP they still needed supervision from their mentors; this affects production overall. The employment statistics from this study also showed that in AATP apprentices were less likely, than those apprentices following the normal route, to be retained by their host companies. Due to its structured nature there continues to be a misconception that AATP artisans are less competent than their counterparts who took the more orthodox route. This misgiving is attributed to the limited workplace component on the programme. The UCS study clearly shows that quantitatively

the AATP is performing well and meeting targets; however there are concerns regarding the quality of the programme. The concern internally within MerSETA, and perhaps in industry, is whether or not the artisans who qualify on the AATP were employable. This concern was then turned to integrating quality into the programme or a means to measure the quality produced by the programme. In response to some of these issues MerSETA embarked on a search to find a tool that would assist in measuring the quality and efficiency of all their artisan development programmes. The decision was influenced by factors both internal and external to the SETA.

One of the most significant factors which focused the outlook of MerSETA was the shift from the second to the third phase of the National Skills Development Strategy (NSDS II & III). With the introduction of NSDS III SETAs had the opportunity to develop research capacity and programmes that would provide direction for sector skills planning and implementation in the various sectors. NSDS III provides a framework for the skills development levy resource utilisation of SETAs and the National Skills Fund (NSF) it also sets out the responsibilities and linkages with other education and training stakeholders.

The following is an extract from the NSDS III document outlining the rationale and objectives of DHET's skills development agenda. According to the document the NSDS III is strategically supported by five pillars which may be listed as follows (DHET, 2011; pp 8 – 9):

- Sector strategies (aligned to government and industry development strategies), programmes and projects developed with, and supported by, sector stakeholders. The DHET will to play a leading role in forging a closer working relationship and collective identification of skills development priorities, amongst all the key institutional players in the education and training system.
- Relevant sector-based programmes addressing the needs of disadvantaged groups and those entering the labour market for the first time will be developed and piloted by the SETAs, with roll out being planned, managed and funded, where appropriate, in partnership with the NSF. SETA funds primarily to be used to fund the skills development needs of employers and workers in their sector. However, the utilisation of SETA discretionary funds must be guided by the goals of NSDS III.
- Professional, vocational, technical and academic learning (PIVOTAL) programmes. These are programmes which provide a full occupationally-directed qualification.

Such courses will normally begin in a college or university and would include supervised practical learning in a workplace as part of their requirement. The courses would culminate in an occupational qualification. PIVOTAL courses will normally be offered by arrangement between a SETA, an educational institution, an employer and a learner

- Programmes that contribute towards the revitalisation of TVET, including the competence of lecturers and trainers to provide work-relevant education and training, and promote occupationally directed research and innovation. Incentives for training and skills development capacity in the cooperative, NGO and trade union sectors, including community and worker education initiatives, contributing to effective training of youth and adults.
- Partnerships between public and private training providers, between providers and SETAs and between the various SETAs, addressing cross-sectoral and inter-sectoral needs. An increased focus on skills for rural development to support government's prioritisation of rural development.

The strategy is informed and guided by other overarching government policies programmes, especially the Human Resource Development Strategy for South Africa, the requirements of the New Growth Path, the Industrial Policy Action Plan, the outcomes of the Medium-Term Strategic Framework, the rural development strategy as well as the new environment strategy, amongst other priorities of government. It seeks a closer synergy between the world of work and our formal education system (DHET, 2011). The state has also initiated the establishment of a Quality Council for Trade and Occupations (QCTO) to specifically coordinate occupational learning and the generation and quality assurance of the provision of occupational qualifications, to complement the work of Umalusi and the Higher Education Quality Council. The QCTO provides the opportunity for improvement in both structure and quality of occupational learning, and in particular workplace learning. The implementation of the AATP therefore operates in a context where there is an urgent need to find the most efficient and effective approaches to address training, both amongst TVET providers and in the workplace, and in which there are changes being made in the environment which could create opportunities for expansion and improvements in provision (DHET, 2011).

In 2010, responding to the question of quality and monitoring, MerSETA contracted consultants to carry out a study that would benchmark the level of competence that currently exists within manufacturing and engineering sectors. The understanding within MerSETA

was that developing quality measurement instruments is essential for shaping TVET practice, planning and policy to establish and maintain an innovative TVET system (Rauner et al., 2012). The MerSETA partnered with the TVET Research Group from a leading German university to commission a study that would profile the development of competence amongst apprentices being trained in the electrical field. The partnership conceptualised and initiated an ambitious transfer project titled "Implementing modern TVET Research Tools in South Africa: QRC [Quality, Returns and Costs], COMET [Competence in Electro-Technology] and VI [Vocational Identity]" (Rauner et al, 2012). This partnership was envisioned to facilitate the transfer of skills and knowledge between South Africa and Germany; especially in the field of research and development. This collaboration would enable MerSETA to gauge the quality of its qualifications on an international level as well as track the development of individual apprentices within the system.

COMET is a form of Large Scale Competence Diagnostics (LS-CD) in TVET and is one of the instruments that can be used for assuring and developing quality. LS-CD makes it possible to measure occupational competence across occupations and across TVET systems on an international scale. The COMET instruments make it possible to measure whether or not learners are able to solve occupational tasks completely and at what level they are able to solve these tasks (Rauner et al, 2012). The COMET competence model incorporates a contextual element in the form of the vocational identity (VI) research. The VI research stream explores the psycho-social development of apprentices within a particular trade (occupation). It investigates the relationship that exists and develops between the apprentice and their trade, on the one hand, as well as their host company during their training. The hypothesis is that the more developed an apprentice's identity in their craft, the more committed they are going to be in executing their job and thus much more likely to develop holistic competence. This hypothesis has been tested and verified internationally in Germany and China and has been proven to be relevant as a reference tool to shape vocational education processes in practise (Rauner et al, 2012). The third research stream (QRC) consisted of adapting, implementing and testing of an online measurement instrument that companies can use to evaluate cost benefits and quality of in-company training in South Africa. Companies can use this online tool to benchmark their own training figures across different branches and against other companies for a specific trade. QRC is now available as a consultancy instrument, which can be used by various TVET advisory bodies; and perhaps in the long run by DHET. The preliminary results of the QRC study put forward the

assumption that benefits gained by in-company training of apprentices are often exceeding its costs and that this core part of technical and vocational education and training can as well be organised as a self-financing system, notably if the quality of training is high.

When MerSETA launched the COMET project in 2011 I was offered an opportunity to be part of the team that would oversee the implementation of the South African leg of the study. Workshops were conducted in 2011 by the research team from the German university in Johannesburg with the project team as well as the steering committee which consisted of members from the participating MerSETA companies and institutions. In these workshops one of the professors from the German university presented his definition of competence and how it is applied within the COMET framework. He then outlined the methodology used in the implementation of COMET and competence diagnostics as a whole. During the course of the project I was based at MerSETA and I was introduced to the systems and processes used by companies in training apprentices. During my tenure working on the COMET study I was also involved in other projects related to skills development. My attention was drawn to the various types of training institutions present in South Africa's TVET system. South Africa's TVET landscape is littered with institutions such as, public and private TVET Colleges, in-company training academies as well as Universities of Technology that provide accredited training programmes from unit standards to technical qualifications. Basing my observation on the COMET framework, the question I have attempted to answer in my study is which one of these types of institutions is the most effective in developing holistic competence within the South African context?

Work on constructing my study began once COMET was finalised and the results of which were published. Subsequent to the release of the COMET study results I was intrigued by the trends that emerged across the sample group. I was particularly interested in the results and trends related to the different training institutions. These results were aggregated from the outcomes of the individual learners who participated in the study from those particular institutions. I was drawn to this particular set of results because of the pattern that emerged between the learners' test scores and the (aggregated) institutional competence profiles that were compiled. The trend between the two data sets showed a strong correlation between the training profiles of the institutions and the learners' scores. The COMET data showed that the learners' results are clustered according to training institutions. On the one hand this trend could be anticipated as the COMET study only consisted of a brief period of exposure to the approach and a once off test at the training institutions. This brief period of exposure to the

COMET approach was arguably not long enough to erode long established teaching and learning patterns in those particular classrooms and workshops. However given that all the institutions were given the same materials to use and specific instructions on how to implement this approach the expectation was that the results would be limited to profiling of the capabilities of individual learners. This primarily due to the tests and questionnaires being aimed at profiling individual learners. Despite the fact that the COMET instruments are specifically designed as a diagnostic tool to track individual competence development they manage to highlight the significance of the role of the institution in developing individual competence. These results prompted further investigation into the dynamics of the relationship between curriculum, pedagogy as well as training culture at an institutional level. These trends could prove quite significant given the diverse skills development landscape as well as TVET in general in South Africa. The underlying question being; given the variety in training institutions and approaches followed in South Africa's TVET system, are institutions being efficient in their approach to developing the necessary competences amongst their learners? Understanding the processes that take place at an institutional level could provide some valuable insight into effective pedagogy and development strategies for effective skills development in South Africa.

Having established a benchmark for the individual competence through the COMET findings (Rauner et al, 2012), my study shifts the focus from learners to the training institutions where their skills are learned and developed. The sample group consists of those training institutions which participated in the COMET study; I have persisted with these institutions for the sake of consistency with the conceptual framework that has already been established and validity in terms of analysis tools. Having participated in the COMET study these institutions have recorded benchmarks for their learners' competence levels and profiles. This makes it possible to conduct an in-depth analysis of inter-institution trends related to competence development methods. The variety in the types of institutions included in the sample provides an opportunity to explore the dynamics of the approaches utilised by each institution without being partial to any particular approach. The COMET approach has made significant strides in providing an empirical and descriptive framework for tracking a system's ability to develop various types of competences. Thus utilising this framework I will investigate the application of curriculum, pedagogy and training culture at each institution. In this regard focus will be placed on the relationship that exists between curriculum and pedagogy during the training process. Furthermore attention will be given to contextual factors linked to the

teaching and learning culture at the institutions; from recruitment all the way through to qualification. The details of the sampling rationale will be further elaborated on in the methodology chapter.

The dynamics which form part of the teaching and learning processes within TVET are quite unique from those found in general education. Not only is a learner expected to have a sound theoretical understanding of their subject area but they must also be adept at applying the central principles of their disciplines both in the classroom as well as the workplace. The theoretical component of a TVET curriculum should be arranged and presented in such a way as to facilitate the development of applied knowledge. The theoretical and applied components of a TVET curriculum are arguably interdependent. The conceptual tools used in the construction of this study are formulated to capture this peculiar nature of TVET. With the technical and specialised content that forms part of the TVET curriculum it is vital (arguably) that as a researcher my articulation of the educational processes goes beyond the mere grasping of theory. In this regard I will be utilising Lave and Wenger's (1991) theory of situated learning to frame the analysis and guide my discussions. This particular theory provides a detailed description of the relationship that exists between a learner, their trainer and the training environment. The theory speaks to the training culture that exists particularly in TVET institutions, especially those which have a strong workplace component which in turn facilitates the process of identity formation in a particular occupation. In order to further substantiate the insights of Lave and Wenger I will be applying the Bernsteinian theory of cultural contextualisation of curricula and knowledge. These theories provide a detailed account of the processes as well as factors involved in the creation and transfer of vocational knowledge.

At this point I will provide a summary of the central concepts that will form part of this thesis, I will expand on them in the literature review as well as the theory chapters. The analysis will include the actions that take place in the teaching and learning environment as well as the pedagogic tools that are utilised to create an environment that encourages the development of holistic competences. A central theme across this study is the theme of competence development; particularly the development of holistic/shaping competence. In the context of training institutions I am particularly interested in exploring the methods and processes that are utilised to build the skill-set or capabilities necessary for a learner to succeed in their craft. The term "competence" is not a new concept within the TVET landscape. In the literature this term is cited and is often used interchangeably or

synonymously with the term “competency”. In spite of the similarities in spelling these terms are quite distinct from each other (Delamare Le Deist & Winterton, 2005; Fourali, 1997). There is an argument presented by Delamare Le Deist and Winterton (2005) that proposes that there are broadly four theoretical approaches related to the subject of competence. The four approaches that I will be investigating further are: competence as a behaviour; functional competence; competence as a fuzzy concept; as well as holistic competence. I will present a detailed account of these four approaches in my literature review, this will include highlighting some background studies where these approaches were tested. Within the literature I will also start building a case for one particular approach which I believe captures the dynamics of artisan development and to some extent TVET quite well. At an institutional level these approaches are translated in to different processes of teaching and learning.

My study is broadly framed by the relationship between curriculum and competence; to be more specific, curriculum design and its influence on competence development. Curriculum design involves organising all the components of a particular study or training program into a specific form. Curriculum is generally organised based on; disciplinary knowledge, the field of study and course units (Petrina, 1998). What distinguishes vocational curriculum design from that of general education is that there is also an element of applied knowledge to take into account. (Gamble, 2006; Allais, 2006; Young, 2006).

Problem Statement

The approach to vocational curricula which has been followed to date has been focused on understanding how theoretical knowledge is structured and created within the various disciplines (Gamble, 2013; 2006). However the added component of applied knowledge makes vocational curricula quite peculiar and requires a more substantive approach to unravel how it is structured in relation to the theory component. In terms of the theoretical component, it is generally understood that various disciplines structure their knowledge either horizontally or vertically (Billett, 2013; Allais, 2011; Eraut, 2008). However, from a pedagogic perspective there is a limited understanding [credible theories, effective methodologies] of applied or practical knowledge specifically how to develop and transfer applied knowledge within the context of a teaching and learning space (Billett, 2013; Eraut 2008). Perhaps this observation can be rephrased in the following way, studies conducted within TVET, focusing on the curriculum provide limited insights into how head (theoretical) knowledge can be converted and linked to hand (applied) knowledge.

What seems to be evident from previous studies in vocational curriculum design is that factors such as learning environment, communities of practice as well as vocational culture play a significant role in the development and transfer of applied knowledge (Gamble, 2013; Billett, 2013; Rauner, 2007). The fundamental question then is this; what is the precise nature of the applied knowledge component within a vocational curriculum? What makes certain institutions (or institution types) and individuals more adept at developing and transferring applied knowledge? In the context of this study the guiding theoretical framework utilises the term competence to articulate the concept of applied knowledge. The precise definition and nature of this concept will be discussed in chapter 2. What this study aims to achieve is a greater understanding of the forces and processes which shape and influence the understanding of applied knowledge within the design of vocational curricula at an institutional level. How exactly does curriculum design either impede or facilitate the development of applied knowledge within TVET?

Through this study I will endeavour to answer the following questions;

- What are the patterns of achievement of trainee electricians in the COMET test in relation to their training institutions?
    - ❖ What is the competence profile of the top performing trainee electricians in the COMET study?
    - ❖ What kind of education and training environment do the top performers in COMET come from?
    - ❖ Is there a link between the patterns of achievement and the institutional form?
- What influence does the curriculum have on the development of holistic competence?

Chapter 2

Literature Review

The subject of skills, knowledge and competence within any particular teaching and learning system is quite a complex one. These concepts form a critical nexus around which education and training systems are designed. This study will be focusing specifically on the concept of competence and the dynamics of its relationship with knowledge and skills. In and of itself the concept of competence can be applied quite broadly to a wide scope of outcomes within the education and training process. The nature of the term is such that it has to be understood within the specific context in which it is being applied (Dodero et al, 2007; Delamare Le Deist & Winterton, 2005; Mulder et al, 2006; Eraut, 2008). For the purposes of this study the concept of competence will be interrogated with South Africa's TVET landscape in mind; where relevant a comparative analysis of the global TVET context will be applied. Particular interest will be given to how South Africa's National Qualification's Framework has shaped perceptions of competence in South Africa. The differing opinions across South Africa's own TVET landscape on what constitutes competence necessitates further investigation into the concept and what it entails (Gamble, 2003; SAQA, 2007; Rauner et al., 2012). Within this chapter the different models of understanding competence will be discussed; the various definitions as well as their theoretical constructs. The chapter will then engage with how the concept of competence has been understood within the South African context and how it informs curriculum development. In this regard particular interest will be given to the National Qualifications Framework (NQF) and its influence on how teaching, learning and skills are understood in South Africa. Lastly, a detailed overview of previous studies in the area of competence and curriculum development will be provided.

Competence

A review of related literature indicates a broad spectrum of definitions and understanding of what competence entails. There have been a number of definitions that have been presented by different theorists and scholars regarding competence. However these definitions vary significantly which makes understanding and application of the concept a challenge. Delamare Le Deist and Winterton argue;

> "There is such confusion and debate concerning the concept of 'competence' that it is impossible to identify or impute a coherent theory or to arrive at a definition capable

> of accommodating and reconciling all the different ways that the term is used." (2005, pg. 29)

This line of thinking is consistent with that of Dodero et al (2007) who argue that often the notion of competence is regarded as a synonym for attributes such as knowledge, skill, abilities, and what they call 'other characteristics'. The authors in both cases concede that the current definitions of competence may not be comprehensive enough to provide an accurate means of measuring competence (Dodero et al., 2007; Delamare Le Deist & Winterton, 2005). Generically, a competence can be defined as:

> "An underlying characteristic that leads to successful performance [in any given task], which may include knowledge and skills as well as bodies of knowledge and levels of motivation." (Rothwell, 2006, pg. 6)

Rothwell (2006) goes on to argue that a definition of competence must encompass more than just an individual's skills and knowledge; it must also encompass the uniqueness of the individual. This in turn makes the exercise of measuring competence empirically or implementing a competence diagnostic tool quite challenging in any context. Eraut (2008) further warns that it is an error to assume that any particular definition of competence is 'generalizable'. This would suggest that as with various theories one must be prudent in their application of these various notions of competence. The complexities involved in defining competence provide the starting point on a path to understanding the dynamics of the curriculum/competence relationship and how these dynamics underpin individual assessment within work and learning spaces.

At this point it is critical to note that the aim is not to formulate or to advocate a singular definition of competence from all those that have been put forward. The aim rather is to use the given definitions to build a framework that will provide greater insight into how competence can be understood across various teaching and learning contexts. Across the majority of the literature on the subject, there is a considerable amount of ambiguity regarding competence and its relation to individual traits such as; skills, ability, experience, work ethic as well as identity (Mulder et al., 2006; Teodorescu, 2006; Bergenhenegouwen et al., 1997; Rowe, 1995). At this point I refer to them as "traits" as I have not yet engaged with the subject of their most appropriate conceptual label. However, amongst the myriad of definitions and approaches there is a central theme regarding what competence is and what it is not. What is clear from the literature is that competence entails an individual successfully

meeting the intended objectives of a given work task (Rauner, 2007; Mulder et al., 2006; Moore et al., 2002):

> "The competence concept is therefore concerned with the meaningful objectives and content of learning that will engender the personal development of students and position them within the domain of knowledge that can best prepare them to function effectively in society." (Mulder et al., 2006; pg 4)

> "This infers that an individual displaying competence should be able to apply their skills and/or abilities to a work activity. (Moore et al., 2002; pg 314)

Thus the implication is that fundamentally competence is not a single attribute that an individual develops but rather a combination of abilities, traits and characteristics. Teodorescu (2006) makes a similar argument that traits such as knowledge, skills, mind-sets and thought patterns need to be considered as part of the composite competence package of an individual. The aim therefore is not to isolate the components which constitute competence but rather to build a strong conceptual base of how these components combined make the individual efficient (or more efficient) in executing learning tasks and ultimately achieving workplace objectives.

Conceptually, however, there seems to be an even greater challenge in the understanding of competence. This challenge being the ability to distinguish "competence" from "competency", terms that are so similar conceptually to the point of being identical (Teodorescu, 2006; Moore et al., 2002). Moore et al. (2002) argue that colloquially the terms competence and competency may be applied synonymously, however in an academic or occupational context it is crucial to make a distinction between the two. When defining competence Teodorescu (2006; pg, 28) states;

> "Competence equals worthy performance that leads directly to the most efficient accomplishment of organizational goals." (Teodorescu, 2006; pg, 28)

On the other hand she defines competency as;

> "Those characteristics – knowledge, skills, mind-sets, thought patterns, and the like – that when used whether singularly or in various combinations, result in successful performance." (Teodorescu, 2006; pg, 28).

Moore et al., (2002) take a slightly different angle, they regard competence broadly as the ability to perform successfully within a given area of specialisation (for example; occupation, trade, craft) and competency as a set of attributes and characteristics which contribute to one being competent. From these given definitions it is not surprising then that these two terms are often seen to be interchangeable. Fundamentally the only distinction between the two terms seems to be in the unit under observation. For the purpose of clarity and understanding throughout this chapter and the rest of the thesis; competence refers to an individual's occupational profile as a whole. This means referring to the individual's occupational profile holistically without isolating any of its components. Competency then refers to the singular attributes and traits that make up the individual's occupational profile. This term will be used when isolating specific aspects of individual competence profiles. However understanding what competence is and how to define it is merely a means to an end; the ultimate aim is to understand the interaction between the individual and the work process. It is through this understanding that vocational training programs can be shaped to be as relevant as possible (Rauner, 2007; Mulder et al., 2006; Rodriguez et al., 2002).

To date there have been several attempts at unpacking the concept of competence and the means to measure it. Delamare Le Deist and Winterton (2005) have categorised theories concerning competence into four main groups; competence as a "fuzzy concept", behavioural competence, functional competence and holistic competence. This grouping of theories can be contrasted with the three groups of theories identified by Mulder et al. (2006); behavioural, generic and cognitive theories. The categories presented by Delamare Le Deist and Winterton as well as Mulder et al. are quite similar in many regards however the authors have focused on differing aspects of the theories and their application in classifying the theories into the different categories. The latter focused on the content of the theory while the former emphasised the application of theory. After careful scrutiny both sets of authors reveal common characteristics amongst the various categories. For the purposes of this literature review I will use the categories outlined by Delamare Le Deist and Winterton (2005) as they provide a more comprehensive description of the various approaches to competence. I will also elaborate on the overlaps with the classification of Mulder et al. (2006) where relevant.

"Fuzzy Concept" Approach

This category of theories is constituted by theories that do not follow a distinct approach to the subject of competence but rather they combine various elements from different disciplines. What characterises these theories quite strongly is their fusion of psychological, educationalist, social as well as cultural approaches. Broadly this category of competence includes all those theories that have gone beyond the "tacit understandings" of the term competence to such an extent that they focus on the operational components (application) of the theory. Furthermore these theories give limited attention to the individual (or rather the individual as a unit of analysis) focusing rather on what is needed for the individual to apply themselves effectively in the workplace environment. As a result these theories have become a hybrid of theory and practice to the point of confusion, where the use of terminology can often be ambiguous and difficult to follow. This can be noted in the way in which theories belonging in this category use concepts such as "competence" and "competency" interchangeably. Overall theories in this category draw on a wide variety of theories from other fields in an attempt to address as many issues as possible (Delamare Le Deist & Winterton, 2005; Mansfield, 2004; Eraut, 2000).

It is important to note that competence theories within this category do not propose or promote a specific definition of competence. What this group of theories does rather is to combine institutional mechanisms, individual traits as well as industry needs and formulate an index to measure competence. In this regard a common trait within this category is that each individual theory argues to have the most comprehensive set of indicators for competence. The list of indicators includes amongst others; general cognitive ability, education outcomes, vocational standards as well as cultural considerations (Mansfield, 2004; Weinert, 2001). In essence what these theories show is that there are several ways to view and acknowledge competence from an application point of view. Each theory captures how competence can have differing applications in different contexts (or environments). The difficulty however is that without a unifying or unified theory of competence it becomes a challenge for education institutions working in the same system to formulate benchmarks and milestones that are clear and coherent. This is a significant challenge in cases where means to track the development of a learner need to be implemented.

Behavioural Approach

Competence as a behaviour includes those theories which emphasise personal characteristics associated with superior performance and high motivation within the workplace. These theories suggest a relationship between cognitive competence and motivational habits and actions. This approach is referred to as the "generic approach in Mulder et al. (2006, pg. 6). Roughly competence within this category is defined as an "effective interaction [of the individual] with the environment" (Delamare Le Deist & Winterton, 2005, pg 31). This competence approach observes successful and effective job performers to determine how these individuals differ from less successful performers; thereby placing a high emphasis on the personal qualities the individual brings into the workplace environment. The focal point being production output as opposed to the cognitive disposition of an individual. The definitive characteristics of the behavioural approach are demonstration, observation and assessment of behaviour. Competencies are thus the characteristics of a person that are related to superior performance in a job and can be common across situations (Mulder et al., 2006; Delamare Le Deist & Winterton, 2006).

In contrast to the "Fuzzy" theories of competence, behavioural competence theories focus on personality and characteristics of those individuals who are regarded as being superior or successful in the workplace. What these theories emphasise is that over and above specific knowledge and skills related to certain jobs an individual needs to have certain characteristics and traits in order to be regarded as being "competent" (Mulder et al., 2006; Delamare Le Deist & Winterton, 2005; McClelland, 1998,). The fundamental argument in this regard is that by observing those that are competent one can model their behaviour and personal traits in order that they may also become competent. This view is further corroborated by authors such as Dubois and Rothwell (2004), Rodriguez et al. (2002), Dooley et al. (2001), as well as Spencer and Spencer (1993). They highlight various studies conducted in the United States amongst professionals from different occupations. The results of these studies seem to indicate a high correlation between specific personal characteristics and success in the work place. However in recent years the focus of the behavioural approach has been broadened to include organisational objectives. This has mainly been attributed to the need to align the role of the individual to the strategic outcomes of the organisation, thus improving organisational efficiency and output (Gangani et al., 2004; Collins et al., 2000). The importance of understanding organisational context is also highlighted in Mulder et al. (2006). They

indicate that the broader generic approach to competence emphasises the mapping of generic individual characteristics in combination with organisational demands. While the behavioural competency approach is still favoured in the USA, a broader conceptualisation of competence which also emphasises job-related, functional skills as well as foundational (occupational) knowledge is gaining momentum (Delamare Le Deist, 2005).

Methodologically studies conducted within the behavioural approach are designed to focus on individuals and their personal dispositions and not the specific job or task. These studies observe and document characteristics such as; self-awareness, self-regulation and social skills of an individual (Delamare Le Deist & Winterton, 2005). Fundamentally they are underpinned by the notion that competencies are essentially behavioural and can be learned through training and development, unlike personality and intelligence (McClelland, 1998). One particular study conducted amongst Mexican and American fitness trainers demonstrates that competence is independent of context. Fitness trainers from both countries were asked to list the competencies which they thought were vital for success in their occupation. Out of a list of 39 competencies trainers from both countries ranked 10 common competencies as being critical within their occupation (Dooley et al., 2001). This would suggest that occupational norms and standards can be shared across contexts and the expectations on the individual are common across different locales. This also highlights the significant role played by communities of practice in shaping the development of an individual within a particular occupation.

Functional Approach

The functional approach to competence has its origins in the tradition of TVET in the United Kingdom (UK). Recognising endemic deficiencies of skill formation in the UK, governments introduced a competence based approach to VET during the 1980s in order to establish a nationwide unified system of work-based qualifications (Delamare Le Deist & Winterton, 2005; Heidemann et al., 1998). The vocational qualifications created under this framework were based on occupational standards of competence, grounded in functional analysis of occupations in a variety of contexts (Mansfield & Mitchell, 1996). Standards are defined as statements of competence written to describe desired performance outcomes for TVET learning. The reasoning behind using occupational standards is that the qualifications would be rooted in the "reality of the world of work" (Delamare Le Deist & Winterton, 2005, pg. 34; Mansfield, 1993). The practice in the UK was that employers as well as trade unions

played a leading role in establishing and validating occupational norms and standards. However as with many other state interventions, participation by employers was not universal due partly to bureaucratic issues with assessment procedures (Delamare Le Deist & Winterton, 2005). Part of the employer concerns with the prescribed assessment procedures includes the lack of relevance in some sectors as well as the lack of recognition of informal learning (Konrad, 2000; Bell & Dale, 1999).

In this category of theories the emphasis is on functional application and the ability to demonstrate performance to the standards required of employment in a work context. The definition of occupational competence in this category is the ability to perform activities within a particular occupation, to the standards expected by the employer. Some authors do however also include within their definition the mastery of skills and understanding as well as aspects of personal effectiveness (Mansfield, 1993). Theories that fall within this approach focus on three aspects of competence development; organisational expectations, skills and knowledge as well as individual characteristics (Delamare Le Deist & Winterton, 2005). This definition of competence is arguably the most widely used across various TVET systems internationally. This approach is favoured mainly by employers as it gives them the power to determine the types of competencies to emphasise for potential recruits. I would also argue that from an organisational point of view it provides a far more comprehensive account of the subject of competence in comparison to the behavioural approach. As Mansfield (2004) points out, competence within this approach does to a high extent imply compliances to occupational norms and standards.

> "Competent people [are] those who followed rules and procedures without question. Competence [means] compliance." (Mansfield, 2004, pg 303)

Unlike the behavioural approach, the functional approach recognises the importance of occupation specific skills in the development of competence (Mansfield, 1993). National Occupational Standards describe good practice, what is required in the workplace rather than what people are like, and play a role in linking organisational strategy and individual learning needs (Winterton et al., 2005). It is also more coherent than the "Fuzzy Concept" approach as it clearly outlines the interaction between the individual, skills and the workplace environment. This is captured in the structure of qualifications frameworks which clearly articulates the skills or the degree of application that is needed for an individual to be considered as being competent (Delamare Le Deist & Winterton, 2005).

The functional approach to competence made significant strides in bridging the gap between education institutions and the world of work. With the establishment of standardised qualifications in TVET a systematic approach to occupational training gained prominence in the UK (Delamare Le Deist & Winterton, 2005). However the (over) emphasis on skills as a basis for vocational qualifications has been critiqued predominantly on the grounds that it undermined the acquisition of underpinning disciplinary knowledge within an occupation (Hyland, 1994). Winterton et al. (2005) counter by arguing that this criticism probably reflected, to a large extent, the resistance of educational institutions to adopting a competence based approach. The gaps identified within the functional approach ultimately led to organisations and employers developing their own competence development models. These models incorporated aspects from the behavioural approach (Reilly, 2003).

Holistic Competence

The holistic competence approach is rooted in the European (more specifically the French and Germanic) tradition of vocational training and apprenticeship; the main emphasis is on specifying the necessary learning inputs leading to the mastering of a craft (trade/occupation). Under this tradition competence refers to the capacity of an individual to apply themselves in work-based tasks drawing on their cognitive, theoretical and occupational knowledge (Delamare Le Deist & Winterton, 2005). The holistic approach integrates cognitive, personal and social knowledge in the teaching and learning process. The German dual TVET system is attributed as being possibly one of the best examples of the holistic approach and has had a significant influence in various countries across Europe (Mulder et al., 2006; Winterton et al., 2005). While competence was implicit in the system, the main emphasis was on specifying the necessary learning inputs, rather than outcomes, to master a trade (Rauner et al., 2012; Winterton et al., 2005; Delamare Le Deist & Winterton, 2005).

Rauner (2007) states that in order to develop holistic competencies it is vital for the TVET curriculum to shift its focus from a theoretical focus to include practical and occupation related focus, the emphasis must be on integration rather than modularisation of curriculum content. Thus the ideal vocational curriculum can be systematised not only technically but also as a developmental process from beginner to reflective expert. The notion of competence within this approach is represented in three dimensional models, conceptually these models are quite similar but each one has some distinct aspects. The French model for holistic competence consists of knowledge, experience and behaviour dimensions. On the other hand

the German model consists of content, action and requirement (output) dimensions. The dimensions within these two models help to shape the inputs of trainers at the various levels of learning (Delamare Le Deist & Winterton, 2005). Over and above the three dimensional model the holistic approach places significant emphasis on problem solving as pedagogic tool (Rauner, 2007; Delamare Le Deist &Winterton, 2005). Delamare Le Deist and Winterton (2005) state that the holistic competence approach is an approach to teaching and learning that presents the whole range of skills and knowledge of a particular discipline at all levels. What this means, for example, is that within a three year training programme the range of skills and knowledge expected from a first year learner and a third year learner is the same. What differentiates the two levels is the degree of complexity and mastery of application expected from learners at the various levels. Rauner (2007) argues that this in turn allows for the learner to develop in a more all-round manner. What seems to be evident within the holistic competence approach is the link between the teaching and learning process and the dynamics of the learning environment (context). The challenge with a holistic competence based TVET system is that it is quite complex and requires teachers and instructors to be highly adept at managing the technical and pedagogical aspects of the learning process. Furthermore there is also a significant challenge to align teaching and learning objectives to occupational targets. At this point it is worth reiterating that TVET as a discipline seeks to bridge the gap between the occupational space and the classroom (UNESCO 2012). Through various conceptual tools theories classified under the holistic approach provide an integrated system which articulates the complex mechanics of competence development across various TVET contexts.

Conclusion

Given the various definitions and approaches of competence, one has to concede that there is a significant challenge to gaining any traction when attempting to put theories and principles of competence into practice. It is crucial for the design of any TVET system to be clear which approach is being followed. What can be clearly deduced from the literature is that competence is quite a complex concept with a variety of aspects linked to it. It has also been argued that different cultural contexts influence the understanding of competence which is critical in relation to the extent to which competence is defined by cultural literacy and developing group (occupational) identities (Cseh, 2003). The subject of identity formation and its significance to competence development is also alluded to by Rauner (2007). Rauner

argues that the greater the affinity between an individual and their occupation, the easier it becomes to develop higher levels of competence in that occupation. However, Bergenhenegouwen et al. provide a slightly different perspective on the complex interaction between identity formation and competence development.

> "Competences are more important than knowledge and skills for the successful performance of complex (professional/management) tasks with a high level of responsibility [autonomy]. As far as knowledge and skills are concerned, many people are equal, as can be seen from, for instance, diplomas, certificates, work experience and work results. It is precisely the employee's effort, enthusiasm, motivation and underlying self-image that distinguish the successful employee (superior performer) from the unsuccessful one." (Bergenhenegouwen et al., 1997, pg 58)

The quote above provides a starting point for understanding how to approach the subject of competence. As it has been outlined in the literature review, competence it not a singular attribute but rather a nexus that consists of knowledge, skills, personal and occupational identity rooted within a community of practice (Rauner, 2007; Mulder et al., 2005; Winterton et al., 2005; Bergenhenegouwen et al., 1997). Conceptually it may be argued that this constitutes the most comprehensive description of what the term competence entails. Thus for the purpose of discussion in this dissertation this is the definition that will be applied when referring to the term competence.

Curriculum and Competence

Having provided an overview of current approaches to competence, at this point I will shift slightly to discuss how this is particularly relevant to this study and to TVET in general. It has been argued that, a demonstration of competence provides an indication of an individual's occupational or professional aptitude (Spencer & Spencer, 1993). Each of the approaches discussed above outline different means of development and assessment of an individual's competence levels. Each approach has a distinct understanding of how the process of developing competence should take place, which in turn fundamentally underpins the type of curriculum required to attain that competence. These approaches may differ on their conceptual understanding of competence however they all form a foundational basis from which TVET systems are constructed. The type of approach to competence adopted inevitably influences the structure and the institutions that form part of a TVET system

(Mulder et al., 2006). Over and above the underlying approach to competence development, the construction of a TVET system has to consider a number of significant factors.

> "It is generally agreed that a modern and responsive TVET system needs to take into account current and expected socio-economic conditions including; labour market demand, the needs of both the formal and informal sector in relation to employment, and the professional capacity of TVET teachers and instructors. Further, TVET must attend to the specific employment needs of both rural and urban [contexts] and take account of belief and value systems, religions and customs, and different (particularly in relation to gender and social dimensions in training and employment) regional and indeed climatic variations between regions within a country." (MacDonald et al., 2010, pg 2)

The statement above indicates the critical role of TVET in relation to the construction of modern societies, arguably more so for those within the developing world. Increasingly policy makers across the world are giving more attention to developing effective and efficient TVET strategies (UNESCO, 2012). The curriculum has been identified as a critical tool in TVETs bid to respond to these various challenges (UNESCO, 2012; Mulder et al., 2006). However for the purposes of this chapter and this thesis discussions will be focused on the interaction between the curriculum and competence.

As mentioned briefly above, a modern TVET system needs to be responsive to a number of factors and stakeholders; as such it requires a curriculum that will be fundamentally grounded in disciplinary knowledge whilst being adaptable in practice. According to UNESCO (2012) the curriculum has the potential to be influential beyond the classroom and the training workshop. According to Mulder et al., (2006) an ideal TVET curriculum enables learners to perform the designated tasks required of them within any given occupation or profession. It should also make learners eligible for a qualification that serves as an indication that they have reached a threshold competence level and can perform the relevant tasks within a particular occupation or profession. To paraphrase even further an ideal TVET curriculum is one that is responsive to socioeconomic conditions of a society while it promotes and maintains excellence in the process of teaching and learning. According to Billett (2013) a curriculum provides a structure upon which processes to develop competence can be hinged. In this particular instance there are two particular aspects of the curriculum I intend focusing on as well as some of their implications in relation to competence development. Firstly, I will

explore the curriculum as a framework which guides teaching and learning processes. Particular emphasis will be given to how the curriculum is organised into qualifications and how these qualifications are structured in relation to one another. Secondly, I will be discussing curriculum content and how it is applied at an institutional level to develop competence (Allais, 2007; 2006). A significant part of the discussion will focus on the TVET landscape in South Africa and how the curriculum shapes the various approaches followed by the various institutions.

By definition a curriculum provides the structure around which teaching and learning takes place (Billett, 2013). Whether implicitly or explicitly stated the primary objective of a TVET curriculum is to develop a learner from one level of occupational competence to another. Lave and Wenger's (1991) theory of situated learning has become a critical component of how TVET is conceptualised globally. Their proposed developmental learning trajectory (guiding learners from novice to expert) arguably provides the most vivid articulation of an ideal structure and pacing of a TVET curriculum. According to Lave and Wenger (1991) all forms of learning (more especially in occupation and work related learning) involve carefully structured processes which not only impart the necessary competences but also orientates learners into the occupational culture of their chosen field. They argue that an individual's progression from novice to expert is contingent on their interaction with not only the disciplinary (theoretical) knowledge component of their learning but also with their work environment and other contextual elements. This has a number of implications for the design and structure of a curriculum. The most obvious one being that teaching and learning in TVET ideally needs to be situated within some form of occupational context (Billett, 2013; Rauner, 2007; 2005). Billett (2013) further argues that an effective TVET curriculum creates strong links between institutional learning and work based learning. This would inevitably require enabling institutional arrangements as well as a curriculum which maintains the integrity of the vocational qualification while it systematically exposes learners to the demands of the workplace.

As far as the structure of a curriculum is concerned there are two significant factors to consider when one looks at a TVET curriculum. The first being how vocational curricula are organised into qualifications and how those qualifications articulate with one another. The second is how knowledge within the individual qualifications is structured (Billett, 2013; Sweet, 2013; Rauner et al., 2012; Allais, 2011). First let me discuss the issue of the structuring of knowledge within a vocational qualification. In this section the focus will be on

how learning takes place in the vocational context. What seems to be clear from arguments presented by Billett (2013), Rauner (2007; 2005) as well as Lave and Wenger (1991) is that occupational competence is developed most effectively through curricula that allow learners to engage with work processes first hand under the guidance of an "expert" practitioner. This has been the traditional model of vocational education since before the industrial age.

> "Artisans hold the knowledge of their trade as an integral part of a collective craft identity, so that initiation into a craft or trade is as much a social identity formation process as it is a process of building technical capability." (Gamble, 2013, pg 221)

This line of argument suggests that a significant portion of vocational knowledge is embedded within a community of practitioners who interact with each other and share their experiences and exchange ideas related to their craft (Lave & Wenger, 1991). Billett (2013) further argues that it is probably helpful to consider a practice based curriculum for TVET in terms of the sequencing and pacing of learning and work activities (the jobs, tasks and the human interactions). This, he argues, provides a pathway for novices to first understand the requirements for work and the workplace, then progressively allows them the opportunity to develop the kinds of competences required to fulfil those requirements. This may include learners being given the opportunity to discover that it is their responsibility to initiate and direct their learning. Therefore developing the learning curriculum requires an identification of the sequence of activities that novices need to engage in to progress towards full and effective participation in the completion of occupational tasks (Billett, 2013). Rauner (2007; 2005) uses the term "work process knowledge" to describe this type of knowledge and argues that it should form the basis of any vocational curriculum. These kinds of competences require particular pedagogic interventions and a flow in the curriculum that clearly outlines the necessary learning processes to adequately support the individual learner's competence development trajectory (Gamble, 2013; Rauner et al., 2012). This not only requires active participation in the learning process by the learner but also the teacher. Thus it is necessary for the TVET curricula and more specifically TVET qualifications to provide the necessary structures to maximise the development of competence amongst learners.

Individually qualifications need to engage the learner at the level of competence that they are in while at the same time increasing their occupational capacity. Collectively (within the structure of the NQF) TVET qualifications have to provide a seamless transition for learners from one level to another (Rauner et al., 2012). If TVET qualifications are to develop the

types of competences that increase the employability of learners, greater emphasis has to be placed in effectively incorporating theoretical, technical and occupational components into the design of TVET qualifications (Rauner et al., 2012; Rauner, 2007; Allais, 2011). Moreover the articulation between TVET qualifications within the NQF needs to be mapped out in greater detail, a nuanced understanding of the interplay between theory and practice is crucial in this regard (Gamble, 2013). However one must be mindful of the ever-changing nature of vocational work. The increased use of technology in industry might require a different approach from the one most institutions have become accustomed to.

The organising of teaching and learning activities within the curriculum makes up only a single component of the design. Teaching and learning is organised in a specific way to ensure learners are exposed as much as they can to the field of study. However in the case of TVET it has been argued that the underpinning disciplinary knowledge is as crucial as the outcome and the approach (Gamble, 2013; Billett, 2013; Eraut, 2008). Using the definitions and approaches outlined by Mulder et al. (2006) as well as Delamare Le Deist and Winterton (2005) it may be argued that the design of South Africa's TVET curriculum is an example of the functional approach. It has all the characteristics; high emphasis on outcomes, distinction between "book" knowledge and applied knowledge; as well as separation of the classroom and the workplace. This is reflected in the institutional arrangements that for the TVET system. Some of the implications of this is that the qualifications end up being highly generic, lacking in specialised knowledge and skills needed to operate within a specific occupation (Marock, 2011; Rauner, 2007; Gamble, 2003).

Arguably the current arrangement of TVET institutions and the labour market has restricted the development of vocational curricula to an extent where significant portions of TVET learning are removed from the work environment. In the long term this arrangement limits the potential for the development of holistic competence amongst TVET learners (Rauner, 2007). This may be largely attributed to the fact that occupational knowledge systems are embedded within work processes. Thus it is crucial for TVET institutional arrangements to bridge the gap between the work and learning spaces (Allais, 2011; 2006; Rauner, 2007). Marock (2011) further indicates that within industry there is a strong belief that if the competence levels of TVET learners are to be improved, then curricula that is sector or occupation specific should be developed to make provision for occupation specific skills and knowledge. This poses a number of challenges for the development of vocational competence within the TVET landscape of South Africa; firstly, this approach undermines the knowledge

structures that hold vocational learning together, secondly, it is based on the assumption that different types of knowledge are comparable and can be acquired in the same manner and thirdly, that the culture of learning within vocational education and academic education is the same (Chisholm, 2010; Allais, 2006; Winberg, 2006; Gamble, 2006). What is required of a TVET learner is not only an internalisation of theory within the discipline but also how to utilise this knowledge in a practical way. The key is in understanding the types of knowledge underpinning the various vocational disciplines, aligning the content with the appropriate knowledge structures and embedding that within a context that immerses the learner in the culture of the discipline (Gamble, 2013; Rauner et al., 2012). Perhaps to rephrase slightly a curriculum designed on the premise of "knowledge-based practice" (Gamble, 2013, pg 213).

Muller (2006) applies the Bernsteinian concept of hierarchies of knowledge as a starting point for discussing effective TVET curriculum. He argues that various types of curricula for any subject are most effectively determined from within the particular field of study (that is, by the practitioners). Muller (2006) goes on to show how the nature of these disciplinary knowledge structures link content with theory while providing some form of outcome attached to it. In this regard outcomes serve as loose guidelines for teaching and learning while emphasis is placed on building the learner's knowledge base and mastering the necessary skills. In terms of teaching and learning in TVET it may be argued that it is critical that we keep in mind that knowledge aligned to occupational disciplines is a combination of subject specific (explicit) knowledge and tacit (competence) knowledge. It is also vital to consider the context within which that learning takes place (Lave & Wenger, 1991; Lam, 2000; Winberg, 2006). Thus one could argue that an approach that emphasises outcomes over core subject knowledge weakens the knowledge systems within the particular field of study. Gamble (2013) and Rauner et al. (2012) argue that in the case of TVET it is highly recommended that there be overlaps between disciplinary and occupational knowledge structures within the design of a TVET curriculum. What is clear from a number of TVET scholars is that, with a significant portion of the TVET teaching and learning being contextually located in the work environment, it is crucial to establish the correct balance with foundational disciplinary knowledge.

The South African approach to education (not only TVET) is constructed around the crucial mechanism of the NQF. The NQF is organised around the basic premise of structuring qualifications hierarchically into levels of increasing outcome requirements. Across various fields of study, disciplinary knowledge is structured in a way that fits the criteria of the NQF

(Allais, 2011; Gamble, 2006). These qualifications are intended to be outcomes-based and can be applied across different contexts (SAQA, 2003; 2007; Allais, 2006; 2007). Rauner et al. (2012) notes that TVET in South Africa is bound to the notion of preparing an individual for the labour market or at the very least equipping them with a skill that they can use to carve out a livelihood for themselves. Thus the South African system is, arguably, deliberately designed to develop individuals with very specific skill sets (that of skilled labourer). It has been argued that education policy in South Africa has been 'trapped' in a paradigm that has quite a narrow perception of what education entails and how to attain it (Allais, 2011). It is argued by SAQA (2003) that by applying an outcomes based approach it is possible to evaluate qualifications uniformly across different learning pathways. However due to its design it may be argued that the NQF tends to have a better fit with a curricula designed for general education more than TVET. This possibly due to the fact that TVET is distinct from general or academic education in that it is a convergence point for various modes of occupationally oriented training programmes as well as context specific knowledge (Muller, 2006; Gamble, 2006). This requires TVET curricula to be tailored for specific occupations as different occupations require a different set of competencies. Therefore the challenge for the NQF in relation to TVET, as a number of scholars indicate, is providing a mechanism that is flexible enough to recognise the need for curriculum content to be specific to the field of study (Billett, 2013; Sweet, 2013; Rauner et al., 2012; Rauner, 2007).

According to Rauner et al. (2012) the modularisation of knowledge across the different NQF levels disrupts the continuity required to develop the holistic competences required for TVET qualifications. The argument made by Rauner et al. (2012), Gamble (2013) and other scholars is that a modularised curriculum fragments the underpinning disciplinary knowledge. This is not to say that modularised curricula do not produce the necessary occupational competence, however, what is critical is that they should be implemented in a way that fits the requirements of a particular learning area. In this regard Rauner (2007) argues that a curriculum conducive to competence development has to follow a structure of developmental learning tasks organised into interlinked learning areas. Fundamentally he argues for a greater emphasis on content and strengthening teaching and learning processes at each level while making the focus of each level competence development (Rauner, 2007). In other words the NQF as it exists currently needs to acknowledge that knowledge within TVET is not generic; knowledge is contingent on context, discipline, subject and of course it is occupation specific (Gamble, 2013). Ultimately vocational curricula must be responsive to the socioeconomic

reality faced by those within (learners) and outside (industry/labour market) of the system, while on the other hand qualifications must be rigorous enough to ensure that graduates of the highest quality are produced to meet the development needs of the country.

Conclusion

As has been discussed above a modern TVET system needs to be responsive to a number of factors and stakeholders in order for it to be considered as being functional. Moreover, whether implicitly or explicitly stated the primary objective of a TVET curriculum is to develop a learner from one level of occupational competence to another. Therefore it is required of TVET curricula that to be fundamentally grounded in disciplinary knowledge whilst being adaptable in practice. As reported by UNESCO (2012) the curriculum has the potential to be influential beyond the classroom and the training workshop. According to Billett (2013) a curriculum provides a structure upon which processes to develop competence can be hinged. Currently the greatest challenge in designing effective TVET curricula in South Africa is the arrangement of TVET institutions in relation to the labour market. This arrangement has restricted the development of vocational curricula to an extent where significant portions of TVET learning are removed from the work environment. In the long term this arrangement limits the potential for the development of holistic competence amongst TVET learners (Rauner, 2007). Moving forward the solution could be found in building stronger links between TVET institutions and the labour market, specifically during processes of curriculum development.

Theoretical Framework

Due to the complex interplay between knowledge, skills, competencies and identity it is critical for one to apply a theoretical framework that provides the necessary conceptual tools adequately articulate these complexities. Due to these dynamics the theoretical framework for this study has been selected from the holistic approach to competence. As indicated in a number of articles (Rauner et al., 2012; Rauner, 2007; Winterton et al., 2005; Delamare Le Deist & Winterton, 2005) the holistic approach incorporates cognitive, occupational, behavioural as well as psychometric components into a model to analyse competence development. This model is based on a three dimensional notion of competence (this shall be articulated in more detail in the next section), which emphasises a structured pedagogy with a

significant proportion of work integration as a learner is guided from novice to expert (Rauner, 2007; Lave & Wenger, 1991).

In contrast to other approaches which attempt to isolate singular attributes or traits of competence, the holistic approach systematically organises the various aspects of competence into a matrix to gain greater insight into the interaction between an individual and their occupational environment (Rauner et al., 2012; Rauner, 2007; 2005). Moreover TVET as a discipline is constructed from the premise of fusing disciplinary knowledge, occupational application as well as personal development (UNESCO, 2012; Borgen & Hiebert, 2002). As a framework the holistic approach provides the necessary tools to explore the complex factors which might influence competence development both in the workplace as well as in the classroom. As indicated in the previous chapter my research aims to build on the findings of the COMET study conducted by the MerSETA in South Africa in 2011. The COMET study is firmly rooted in the Germanic tradition of TVET and follows the holistic approach developed by a TVET research group at a leading German university (Rauner et al., 2012). The three dimensional model of competence was constructed with the intention of being adaptable and relevant across various teaching and learning systems (Rauner, 2007; 2005). Thus providing an ideal framework for my study as it attempts to better understand the relationship between the curriculum and competence development.

Three Dimensional Competence

Theoretically holistic competence theory provides an integrated approach to the subject of competence development within TVET. The three dimensional model of competence presented by Rauner (2007) was developed as an attempt to operationalise the conceptual tools of holistic competence theory. Didactically this model systematises the application of work process knowledge and the design of occupation related tasks within the classroom. The model provides a framework through which TVET practitioners can develop more efficient teaching and learning processes and materials (Rauner et al., 2012). The model consists of three dimensions (action, content and requirement) which work together in tandem to create a holistic teaching and learning experience for both the learner and the educator.

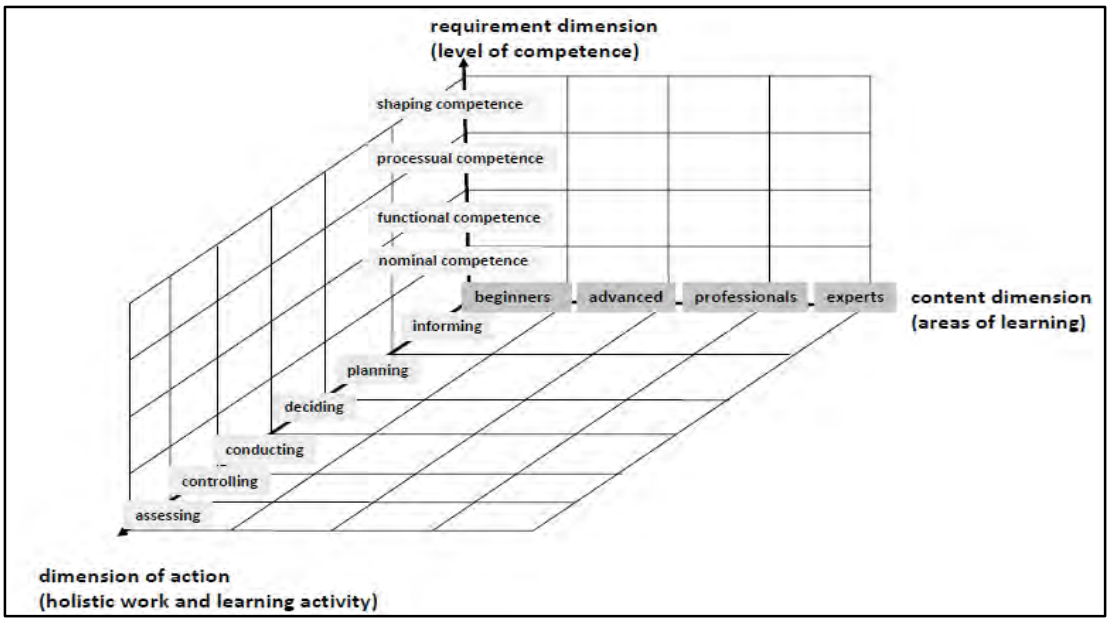


Figure 1: Rauner's Three Dimensional Competence model (Rauner et al., 2012, pg 8)

Figure 1 (pg 48) above shows Rauner's Three Dimensional Competence Model as represented on a three axis graph. The *x* axis consists of the content dimension, this dimension is concerned with the formulation of teaching and learning content which is relevant to the learners' level of development. Along this axis are the various developmental milestones as articulated by Lave and Wenger (1991). The *y* axis consists of the requirement dimension, this dimension represents the levels of professional competence that a learner may attain through the process of their training. The z axis is made up of the action dimension, this dimension consists of the various actions applied by the teacher/instructor. This dimension focuses on the practical processes applied to facilitate learner development. Below I outline each of the dimensions in greater detail.

Content Dimension

The content dimension of the three dimensional competence model focuses on the content of teaching and learning processes within a specific subject which forms the basis for the preparation of learning and assessment activities. The content dimension is constructed around the notion of a learner progressing along a certain developmental trajectory (novice to expert) as they continue with their TVET instruction. This, Rauner (2005) argues, makes it possible to arrange occupation-specific curricula content according to the corresponding stages of learner development. Moreover this facilitates the framing of content for TVET

specific learning areas, modules and qualifications. Concerning the selection of curriculum content, Allais (2006), makes the argument that in the process of constructing a curriculum one must take into account the fact that knowledge is domain specific and knowledge across various occupational fields is structured differently which ultimately dictates the structure of learning programs. Muller (2006) goes on to state that there are two types of knowledge systems which make up the various learning areas or subjects. There are those subjects whose inherent knowledge system is vertically structured and there are those which are horizontally structured. Over and above the internal knowledge systems underpinning vocational disciplines, a critical consideration is the integration of an occupational context in the formulation and sequencing of teaching and learning content. Thus the three dimensional model of competence frames curriculum content according to the levels of occupational expertise of the learner (novice, advanced beginner, competent performer and proficient performer). This offers a basis across different occupational areas for the systematic identification and selection of content for the construction of occupation-specific learning and test assignments (Rauner et al, 2012; Rauner, 2007).

Through learning and development theory COMET has utilised the content dimension to design its test instruments. The application of this dimension in the development of test instruments for specific occupations and occupation related tasks makes it possible to implement studies focusing on occupation specific activities whilst utilising a "trans-occupational" framework. To do this requires practitioners from the various occupations to have an input into the design process of learning and test instruments. A practical example of this would be involving plumbers in the process of developing materials for a plumbing course or nurses for a nursing course. Thereafter the inputs from practitioners would then be subject to a quality assessment framework applicable across occupations. This way the competence levels and competence development of learners in different occupations and different TVET systems can be assessed objectively. At the same time the concept of the content dimension provides the opportunity to systematically evaluate the development of competence at different stages of a vocational training process (Rauner, 2007). Figure 2 (pg 50) illustrates how teachers and instructors can use the various stages of learner development to select the most appropriate content and teaching approach.

This process subscribes to a similar logic as Bernstein's (2000) concepts of classification and framing. Bernstein states that, in certain subjects, knowledge is structured (classified) hierarchically. At the lower levels of the knowledge structure learners require more input and

guidance from teachers regarding the fundamental components of the subject. At this point curriculum content is rigidly framed and learners have little room to deviate from the guidance of the teacher. As learners progress higher up on the knowledge hierarchy less guidance is required from the teacher, the curriculum becomes more loosely framed and learners are given more opportunities to deviate from the lesson plan. According to the model learners at level 1 of training require and are offered curriculum content which will provide fundamental knowledge of the discipline as well as tangible interaction with tools and materials. At this point the approach provides step by step instruction of the technical aspects of their occupational role (rigid framing and classification). As learners progress through the levels and become familiar with occupational norms and expectations the instructor takes a less prominent role in lesson guidance and becomes more of a supervisor. At the highest level curriculum content has to integrate fundamental occupational knowledge with instruction on organisational processes and systems. The learner has more autonomy to experiment with various aspects of the work process and refine their technical skills.

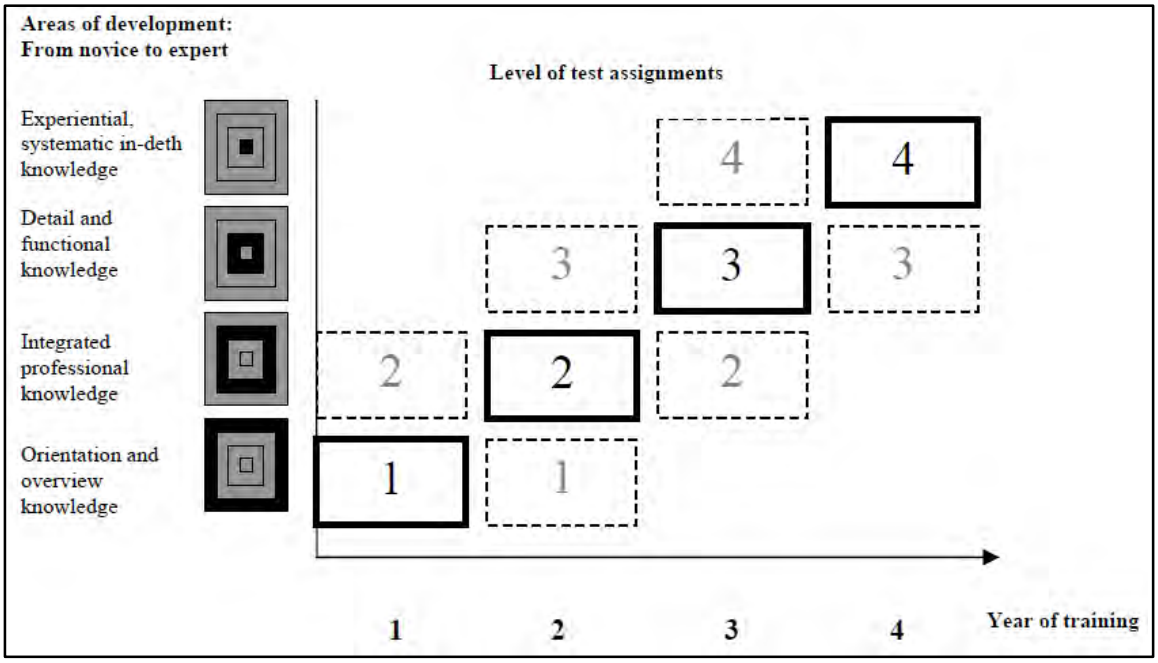


Figure 2: Areas of Development; From Novice to Expert (Rauner et al., 2012, pg 10)

Action Dimension

The action dimension focuses specifically on the practical aspect of the teaching and learning process; the types of activities applied in learner development. There are two types of activities which have been identified as being essential within various TVET fields, but their application and emphasis varies across TVET programs. The first, referred to as instrumental type, focuses on professional tasks with a clearly defined objective or outcome. These types of tasks are dependent on the specific outcomes for a technical problem being stated at the beginning of a training exercise (Rauner et al, 2012; Gamble, 2006). These types of activities require a structured and systematic approach from a learner in order to complete them. These are referred to by Gamble (2006) as "context-dependent" activities, these require specific technical application and understanding. The outcomes of the task determine how the learner proceeds in solving problems linked to the task. These types of tasks are prevalent in specified work processes and projects where the room for manoeuvre is relatively small (Allais, 2006; Gamble, 2006).

The second type of activity, dialogical type, is characterised by open-ended objectives and by a course of activities that can be foreseen and planned only to a limited extent. The methodology and objectives emerge at the same time as the process of completing exercises unfolds (Rauner et al, 2012; Gamble, 2006). This type of activity is most common in classrooms where there is continuous dialogue between the teacher and the learners. Gamble (2006) refers to these types of activities as "context-independent" activities. The teachers respond to the impulses, suggestions, questions and answers of their learners. This means that the learners (who are the subjects of the learning process) co-determine the course of the teaching and learning process (Gamble, 2006). To some extent the teacher anticipates the potential reactions of the pupils, however they have to be flexible in their approach as the feedback they receive from learners also shapes how tasks are completed and understood by the learners.

Thus the action dimension takes into account both types of activities (instrumental and dialogical) as they form a critical component of teaching and learning processes in TVET. The three dimensional model is specifically interested in how these two types of actions are integrated into TVET programs. Particular emphasis is placed on how these actions are implemented in approaches aimed at facilitating the process of developing learners' work process knowledge.

Requirement Dimension

The requirement dimension represents the levels of professional competence that may be attained by a learner throughout the course of their training, these levels conceptually are conceptually built on top of one another. These competence levels are defined on the basis of skills that are associated with the (holistic) solving or completion of professional work tasks (Rauner et al, 2012). The objective and subjective requirements for the work on and the solution of professional tasks are directly related to the relevant occupational skills within various fields of study.

The framework for the interpretation (marking/rating) of learning and assessment tasks is constituted by eight criteria, these eight criteria are classified into three levels. The criteria-oriented interpretation of the quantitative evaluation of learning and assessment tasks includes a pragmatic definition of how to apply each of the eight criteria. In order to transition from one competence level to the next a learner is required a predetermined threshold score at each level of competence. Quantitatively a learner is required to achieve a minimum score (>5) in order for their task to be considered statistically relevant, qualitatively the extent to which they apply the principles of the eight criteria determines the competence level a participant is assigned to. The multi-level model implies the notion that the competence levels represent a ranking where the value ascribed to the eight criteria increases at each level (Rauner et al, 2012).

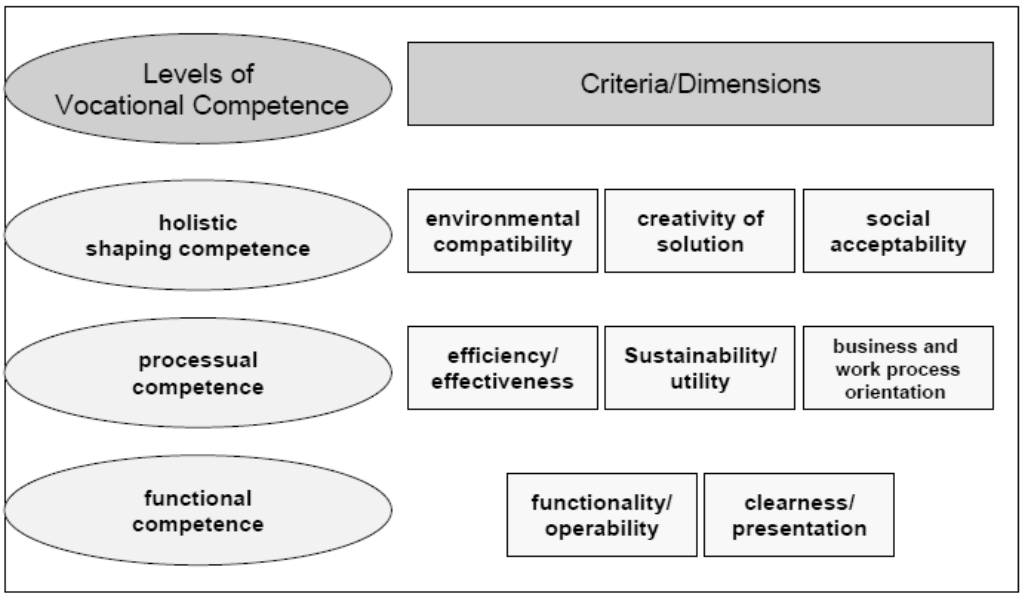


Figure 3: Requirement dimension; level and criteria of professional competence (Rauner et al., 2012, pg 15)

The eight criteria used to guide the interpretation of learning and test tasks are divided according to the corresponding levels of competence. Figure 3 (pg 52) shows how the eight criteria are classified according to the levels of competence conceptualised in COMET. These eight criteria are classified hierarchically, where those corresponding with functional competence are ascribed a lower qualitative value than those at the holistic shaping level. The competence levels that can be attained by a learner are independent of the phase of training might be in. The competence model presented here makes it possible to determine, with the help of open assessment exercises, the competence level that a test taker is ranked (Rauner et al., 2012).

Conclusion

Theoretically Rauner's (2007) holistic competence theory provides an integrated approach to the subject of competence development within TVET. Rauner's three dimensional conceptualisation of competence provides an empirical mechanism to understand the various teaching and learning inputs which shape competence development. The three dimensional model of competence was developed as an attempt to operationalise the conceptual tools of holistic competence theory (Rauner, 2007). Didactically this model systematises the application of work process knowledge and the design of occupation related tasks within the classroom. The model provides a framework through which TVET practitioners can develop more efficient teaching and learning processes and materials (Rauner et al., 2012). This process subscribes to a similar logic as Bernstein's (2000) concepts of classification and framing. It provides a starting point towards understanding the pedagogic implications of transferring various types of knowledge within a TVET context. Using Bernstein's (2000) theory of knowledge hierarchies as well as Rauner's (2007) three dimensional competence it is possible to conceptualise possible knowledge hierarchies inherent within the various TVET disciplines. It is worth noting that the three dimensional model of competence is not only limited to vocational education but it is adaptable to all types of education settings.

Chapter 3

Methodology

The aim of this study was to interrogate the relationship that exists between competence development and curriculum within South Africa's Technical Vocational Education and Training (TVET) sector. In order to conduct research of such a complex nature the study was broken down into three focus areas:

- Investigating the correlation between individual and institutional competence profiles as reported in the COMET Study,
- Understanding the relationship between the official curriculum and the trends in student competence emerging from the COMET study,
- Exploring the official curriculum utilized by training institutions across South Africa's TVET system.

The findings from the COMET study play a prominent role in shaping my research focus as I was actively involved in the data collection phase of the study. It is therefore critical to clarify my role in the COMET study and how my involvement in that study has influenced my subsequent research into competence in TVET. I was designated as a research coordinator by MerSETA, part of my responsibilities included coordinating the fieldwork, providing progress reports to all the participating stakeholders and building institutional capacity within the MerSETA to effectively implement the findings. My role in COMET was intended to develop my understanding of competence diagnostics and implementing competence diagnostic studies. The arrangement was for me to utilise the resources of the COMET study to compile my dissertation. Following the release of the findings of the COMET study I was granted access to the raw data and the findings by the MerSETA to use as part of my dissertation. It must be noted however that despite the fact that the COMET study may be prominent in informing my research I have conducted further research into the subject of competence development. With permission from MerSETA I have made use of the statistics and graphics from COMET; the high level findings and the conceptual model. I have then used these to explore the role played by the official curriculum in laying the platform for competence development at the institutional level.

It must be acknowledged that the conceptual framing of my research is significantly influenced by COMET and my engagement with the raw data and processing thereof. Therefore much of the discussion in this thesis is based around similar conceptual themes as those of COMET. This is by no means a new phenomenon as Corbin, Dwyer and Buckle

(2009) note that as a researcher one occupies both insider and outsider roles during the research process. As noted by a number of theorists, it is crucial for social researchers to clarify their roles especially for those utilizing qualitative methodology to make their research credible (Unluer, 2012; Corbin Dwyer & Buckle, 2009). In this regard it is worth noting that my research has a certain bias towards COMET's conceptual framing of competence and its understanding of how competence is developed (Unluer, 2012). This is not surprising due to the fact that as an insider I was involved in the implementation process of COMET, adapting the instruments for the South African context, being trained on how the conceptual model works and how to interpret the data. Thus placing me in a position where I could potentially replicate the study. However, as an outsider I have taken the position of interrogating some of the findings generated by the COMET study. I have used my understanding of the findings to design a study that will go beyond investigating competence at the level of the individual learner but rather exploring institutional dynamics which play a role in shaping competence.

Concerning the issue of validity, I have clearly stated where I have made use of COMET data and clearly indicated why I have included it and how I have utilised it. I have utilised a methodology that clearly distinguishes between data and findings generated by COMET and data generated through my own research. As stated above I have clearly articulated my role as a researcher in both studies. The necessary rights to utilise the data and other intellectual property related to the COMET study have been obtained from MerSETA, who are the owners of all intellectual property rights related to COMET in South Africa. Throughout the course of this thesis I have clearly referenced and acknowledged the authors of COMET as well as MerSETA where I have made use of the raw data and statistics from the study.

COMET Data

COMET was developed by a TVET research group from a German university to get insight into TVET's effects on the learners' development of competence. Measuring occupational competence is not seen as an alternative to the established forms of learner assessment whether during the course of their institutional training or at its end (Rauner et al., 2012; Rauner 2007). But rather it was conceptualised with the notion of gaining further insight into strengths and weaknesses of TVET based on different forms of school-based and on-the job training as well as contextual factors such as regional and national socioeconomic conditions (Rauner et al., 2012). The study is conducted by assessing the development of competence levels as well as competence profiles amongst individual learners and institutions. The study

further documents the development of vocational identity and occupational commitment amongst test groups. The overall objective being to provide empirical tools that will inform TVET policy (design and implementation) processes. The COMET competence model is also a didactic tool which allows instructors to develop and evaluate pedagogy and content according to the concept of learning areas (Rauner et al., 2012).

The COMET model consists of three primary data collection instruments; occupation specific learning tasks and exercises, occupation specific assessment tasks as well as biographical questionnaires. The learning and test tasks are designed to develop and test learners' problem solving capabilities. The tests provide learners with work related problems which they must solve, they are designed to be open ended to allow learners the opportunity to apply their minds in problem solving. The results of this type of competence diagnostics do not focus on the learner's performance in completing the test task but rather it focuses on the learner's ability to comprehend occupational tasks in their complexity, to weigh up different options and to develop a viable solution. This is based on the argument that occupational competence is domain-specific as it is based in a given world of work that holds different requirements according to different occupations (Rauner et al., 2012).

Study Design

As a starting point it was important to note the incoherent nature of South Africa's TVET system. Within this one system there is a variety of institutions which follow different curricula while applying a myriad of training approaches. Due to this fact it was vital to obtain a balance between focusing the study to capture specific dynamics of the curriculum-competence relationship whilst concurrently being flexible enough to capture any other significant factors in the system that might have not been taken into account in the conceptualisation of the study. The manner in which I aimed to interrogate the processes linking curriculum and competence development consisted of a major quantitative aspect. This mainly due to the fact that a significant portion of my findings were generated through COMET data and statistics. However, as argued in the previous chapter there is an interaction between the curriculum and competence that goes beyond the raw statistics of pass rates and productivity levels of graduates and school leavers.

As discussions in the literature review seem to indicate, the specific design of a curriculum is shaped and underpinned by a particular understanding of what constitutes competence. This

understanding of competence then determines the structure and the content of the curriculum. Thus a qualitative dimension was further incorporated to substantiate the empirical data. In terms of methodology the objective of this study to provide a coherent account of the notions of competence that exist within South Africa's TVET landscape. How competence is understood within the various training institutions and how that shapes their teaching and learning approach. Having taken all of these factors into consideration the decision was made to follow a mixed methods approach to conduct the research.

A mixed methods approach is broadly defined as the use of both quantitative and qualitative methods in the process of collecting and analysing data within a single study (Driscoll et al., 2007; Spratt et al., 2004). Using mixed methods one can capitalise on the strengths of each approach (qualitative and quantitative) and offset their different weaknesses. It could also provide more comprehensive answers to research questions, going beyond the limitations of a single approach (Pluye, 2013; Heyvaert et al., 2011; Johnson et al., 2007). This particular study has made use of a number of primary and secondary research methods. Due to the flexibility of the mixed methods approach I have been able to create a research framework that incorporates all the necessary methods. Using the mixed methods approach as a framework, I have compiled a systematic review of various secondary data sources, legislation and policy documents, curriculum statements as well as the COMET test results.

The type of systematic review I have applied is referred to in the literature as the "Mixed Methods Research Synthesis" [MMRS] (Heyvaert et al., 2011). In such a synthesis the data that are included in the review are findings extracted from several published qualitative, quantitative and mixed primary level data sources. Due to the flexibility of following a mixed methods approach I have also made use of primary sources of data to assist in enhancing the depth of my findings and analysis (Heyvaert et al., 2011). In this particular instance I have combined data from the MMRS with data from unstructured interviews with senior training officials at the participating institutions to triangulate my findings.

This study was located primarily at the synthesis (secondary) level and I have drawn my findings from various education policy documents (which will be outlined in more detail later on in this chapter), the COMET study report as well as the training records from the participating training institutions. However I have also made use of primary data which was generated through interviews with senior trainers. The study was conceptualised in two parts; firstly it is a systematic review of the COMET study, MerSETA policy and training

documents as well as NQF policy documents. Secondly the study consists of an empirical component where primary data has been utilised to further corroborate findings of the systematic review. According to Heyvaert et al. (2011), currently systematic reviews are highly valued as they often form the basis for evidence-based clinical practice guidelines. Due to this there have been new developments in methods and techniques used to systematically aggregate information. At the synthesis level mixed methods research has gained prominence as it presents and analyses data in a way that is relevant for both research and practice (Pluye, 2013; Heyvaert et al., 2011; Johnson et al., 2007).

Method

This study has made use of a mixed methods design to gather and analyse the data. This particular design was beneficial as it has enabled me to effectively triangulate findings from the mixed data sets in the form of primary data, statistics and policy documents (Johnson et al., 2007; Leech & Onwuegbuzie, 2009). As indicated briefly above the data for my study was generated through a number of instruments;

- COMET statistics and findings,
- Policy documents (on curriculum, qualifications and work readiness),
- Curriculum documents for the electronics specialisation,
- Training policies and procedures from the South African Qualifications Authority (SAQA), MerSETA and the participating training institutions.

This research study has drawn on the findings from the large competence diagnostics study (COMET) which was conducted by the MerSETA in 2011. The COMET model is based on principles similar to those of the Program for International Student Assessment (PISA) study and aims to provide an empirical tool for the measurement of competence development within TVET.

The starting point was reviewing the statistical breakdown of the COMET results; the test results of the individual learners who participated in the study as well as institutional aggregates and trends. These statistics and findings were then used as a baseline from which the data collection instruments were constructed. This particular data set was divided into categories; the first category was all the data and statistics related to individual learner performance and the second category was the data related to institutional competence trends. In this particular regard more emphasis was given to the data related to the performance of

institutions as a whole rather than individual learners. The learner data was specifically referred to in instances where the institutional data needed more substantiation.

As a data set, the COMET study's statistical findings were utilised to interrogate whether or not there might be any emerging trends and patterns that might provide some insight into how competence development might be understood at an institutional level. The aim was to gain a better understanding of how the sequencing and pacing of the curriculum within various institutional settings affects might affect the development of occupational competence amongst individual learners. From these insights I compiled all the data collection instruments. These included an open ended questionnaire to be used in interviews with trainers at the participating institutions as well as a rubric to classify data from the various documents to be reviewed.

Once the trends and patterns identified in the COMET study had been established I went on to conduct a systematic review of MerSETA policy documents related to training programmes, NQF policy documents on curriculum and qualifications as well as curriculum statements related to the participating institutions' electronics discipline. These are all documents which form an integral part of informing teaching and learning processes at the institutional level. From this synthesis of policy and training documents I was able to extract significant data concerning the design and implementation of training programmes. In this particular instance the focus was on the official curriculum for the discipline of Electronics across the two participating institutions. Within these policy documents and curriculum statements I was specifically investigating how the concept of competence is defined within the curriculum statements, what methods are prescribed within the curriculum to build this "competence" and finally the measures outlined to assess the competence levels of individual learners. In terms of the training documents the questions I was asking were; how far do the training programmes conform to the curriculum statements, what (practical) measures have been put in place to build the required competencies and what measures are put in place to ensure maximum development of learners. For purposes of conceptual consistency during the analysis process COMET's three dimensional model of competence was followed as a guide to assist in accurate categorisation of themes and trends identified in the findings.

For the purposes of this study COMET was regarded as a baseline study which subsequently informed my understanding of competence and its relationship with the curriculum. A detailed account of the implementation process as well as high level findings of the COMET

study is provided in the analysis chapter. This includes a detailed overview of the methodology, statistical findings (for individual learners as well as institutions) as well as an analysis of those findings. The inclusion of certain excerpts of the COMET study was intended to provide an international comparative account of competence development within South Africa's TVET landscape.

Sample

The participating institutions were purposefully targeted because of their links to the competence benchmarking (COMET) study conducted by the MerSETA in 2011. These training institutions included; 2 TVET Colleges, 1 University of Technology, 1 private Technical College as well as 2 industrial academies. The area of focus for the study was the field of electronics; the training programmes at NQF levels 2 and 3; as the data was generated through competence tests and learning tasks of learners at these two levels of training. The field of electronics was specifically chosen (for COMET) because various courses in electronics are offered across all the participating institutions. Moreover, the electronics curriculum offers learners a generic set of competences which can be applied across a variety of occupational contexts. Thus focusing on electronics allowed for greater validity and reliability of findings across different institutional approaches. The final list of participants was decided upon by MerSETA after a series of workshops and consultation with potential participants.

445 learners took part in the COMET study in South Africa, 300 of these learners also submitted biographical questionnaires. 80% of the learners and test takers were male, 20% female. They came from 6 different training institutions. Approximately 42% received their training at Steel Foundry South Africa (SFSA)[1], 1% at the Eastern Cape TVET College, 12% at Industrial Training Centre[2], 10% at the Vaal TVET College[3], 17% at the University of Technology of Sedibeng[4], and 17% at People's Cars South Africa (PCSA)[5]. The age of the learners across the different training institutions is not significantly different and at the time of the test the average age is around 24,5 years, the age range being between 20 and 40 years. A majority of the learners that provided information (228) were in the second or third year of

[1] Pseudonym used for ethical purposes
[2] Pseudonym used for ethical purposes
[3] Pseudonym used for ethical purposes
[4] Pseudonym used for ethical purposes
[5] Pseudonym used for ethical purposes

training, with the exception being Industrial Training Centre, where more than 60% of the participants were in the first year. At SFSA, 73% were in the second, 27% in the third year of training. At Industrial Training Centre, 61% in the first, 22% in the second, and 17% in the third year. At Vaal TVET College and PCSA, all participants were in their third year. At Vaal University, 43% were second year and 57% third year (Rauner et al., 2012).

COMET Implementation and Findings

The COMET assessment tasks are designed to evaluate competencies directly related to occupational roles; the test tasks are 120 minutes long and are designed to be open ended allowing for learners to apply themselves in solving "real life" cases. The test tasks are rated according to eight criteria (to be discussed in next chapter), which are derived from benchmarks established by the professionals of a particular occupational field. The eight criteria are utilised as a diagnostic framework which rates the learner's work against professional standards. During the marking process a panel of professionals deliberate on how each of the eight criteria are to be rated (how strict or lenient, finding a balance between technical accuracy and innovation). These professionals are then subsequently involved in the implementation of the study within their own institutions. In order for the rating process to be considered as being valid there has to be a high level of consensus amongst the professionals. Once a certain level of consensus amongst the professionals has been established each institution may commence with the implementation of learning tasks; the learning tasks' purpose is twofold. Firstly, they help the test takers to familiarise themselves with this format of the assessment. Secondly, in the long term, they serve as a guideline for designing learning projects that have the potential to close the gap between school-based learning and work based learning (Rauner et al, 2012).

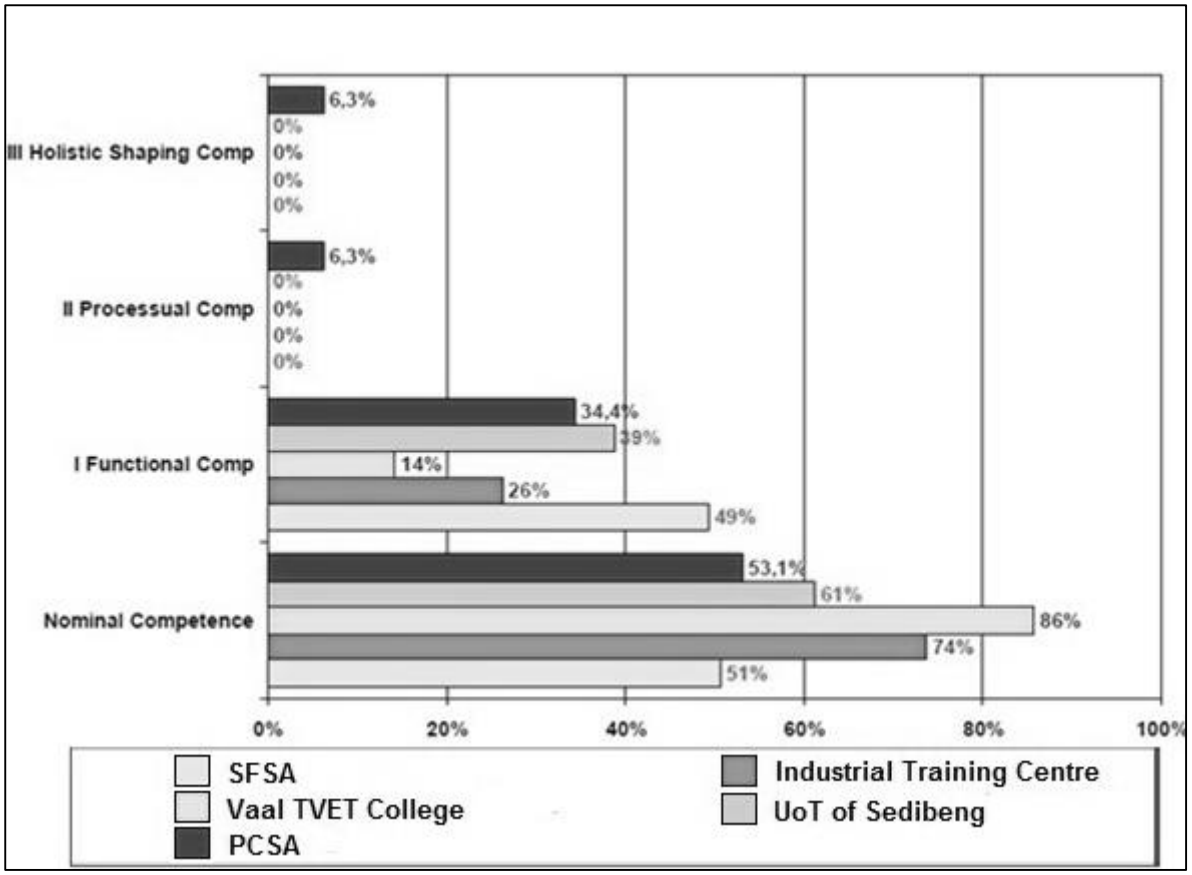
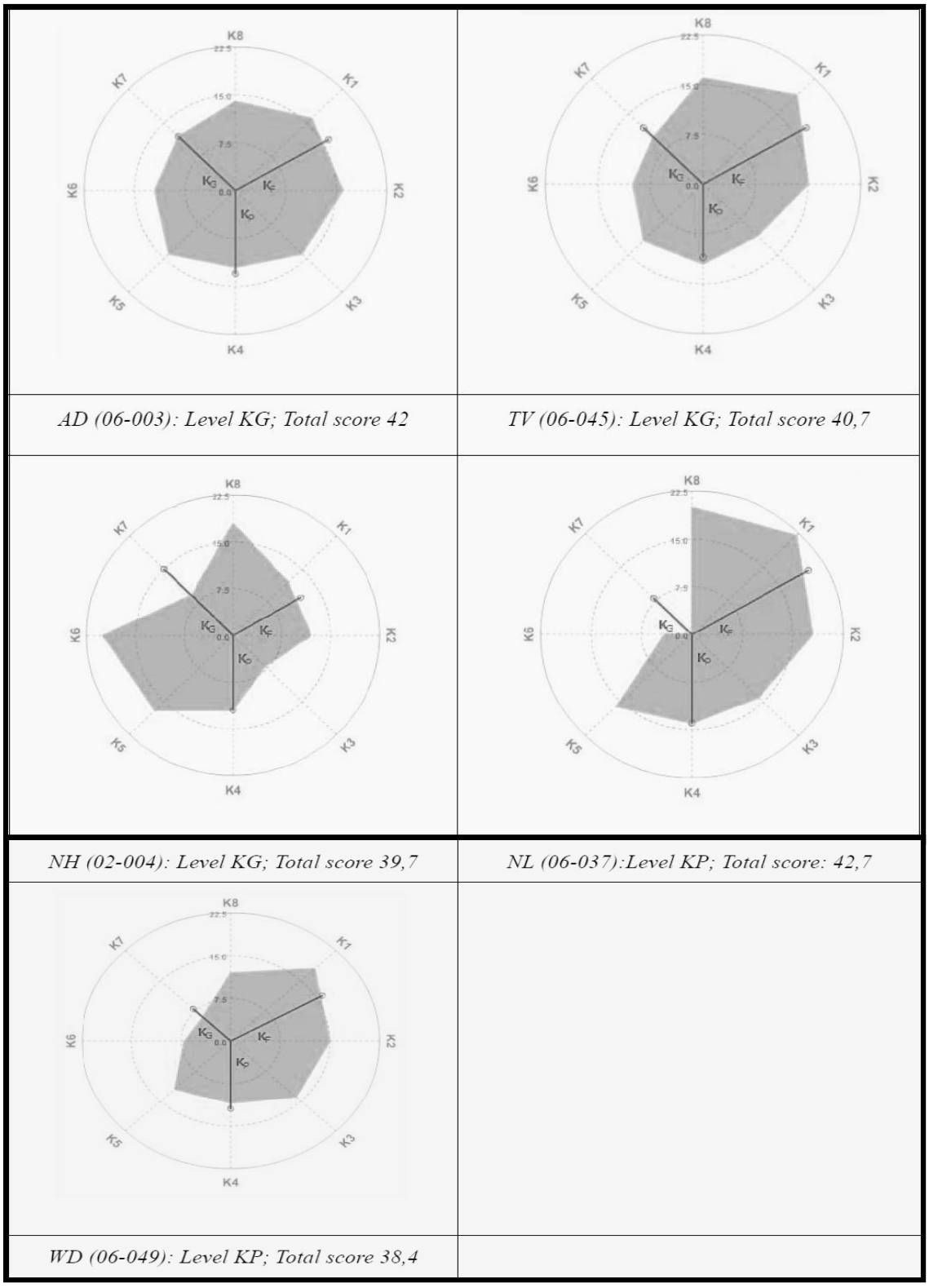


Figure 4: Breakdown of COMET results by institution (Rauner et al., 2012; pg 52)

Of the 300 learners who completed the assessments, 118 were only able to attain total scores of less than 5 points. These results were statistically unusable as learners needed to attain a score of more than 5 points to reach the functional level of competence. Of the remaining 182, 1,6% reached the level of holistic shaping competence, 1,1% the level of processual competence, 37,9% the level of functional competence, and 59,3% are at the level of mere nominal competence. Overall, competence levels as well as total test scores are unrelated to the age and sex of the learners (Rauner et al., 2012). It is also worth noting that statistically competence development trends are consistent across all institutional types. There are however minor exceptions in the case of PCSA, which managed to produce the only learners within the sample who attained the second and third levels of competence. This begs the question; what roles do institutions play in the development of competence? How much of an impact do institutional dynamics play in the development of individual competence? This will be explored further in the next section of this chapter. Five learners within the sample group were able to attain processual and holistic shaping competence. Out of these five

learners four received their training at PCSA and one from the Eastern Cape TVET College. The competence profiles of these learners are presented below.



AD (06-003): Level KG; Total score 42

TV (06-045): Level KG; Total score 40,7

NH (02-004): Level KG; Total score 39,7

NL (06-037):Level KP; Total score: 42,7

WD (06-049): Level KP; Total score 38,4

Figure 5: Graphic representation of top 5 performers in COMET Study SA 2011 (Rauner et al., 2012, pp 69-70)

Rauner et al. (2012) provide the following description of the competence profiles achieved by the top five learners. The total scores are calculated in the following four steps; 1) group the eight criteria into the corresponding competence level [as depicted in figure 3 on page 52]; 2) add the scores for all criteria per level; 3) calculate the average scores per level; 4) add the aggregate scores for each level to calculate the total score. The profiles of learners NH, TV, and AD indicate that they achieved the highest level of competence (holistic shaping) across the whole sample. These competence profiles further indicate the competencies that these learners still need to develop. In this particular instance these learners need to improve on their environmental consideration (K7) and sustainability competencies (K8). It may be argued that these particular competencies (which are less technical), are most likely to be developed through curriculum intervention. The profile of AD shows the competence profile of a learner that achieved a high total score while also attaining the level of holistic shaping competence. According to Rauner this is the capacity to holistically solve occupational work tasks while considering all aspects of the solution (all eight criteria). The profile of TV indicates a learner who achieved a high total score and the level of holistic shaping competence. The competence profile shows all round application of competencies, however the profile reveals an imbalance in the strength of functional competencies in relation to the processual and holistic shaping.

In general, the COMET study found that reflected work experience is one of the most important triggers for competence in TVET. This study conducted in South Africa only gives limited insights into the actual learning processes at the various training institutions. This could mainly be attributed to the fact that the results of the COMET study are based on the outcomes of a single written test. Due to this fact a closer look at the vocational curricula is indispensable (Rauner et al, 2012).

When constructing my particular research study I took the decision to build on the findings of the COMET study, therefore the initial sampling was focused on an identical set of participants as COMET. However due to logistical and timeframe challenges the sample had to be narrowed down. The greatest challenge was utilising the COMET model without necessarily duplicating the study itself. A set of criteria were drawn up to filter the original COMET sample down to two institutions. Over and above their participation in COMET these institutions had to;

- Have some form of affiliation with MerSETA, this would allow for greater access to current and historical teaching and learning data.
- Utilise a Work Integrated Learning (WIL) strategy as part of their main teaching and learning approach (identified by COMET as significant in competence development).
- Provide the learner with a significant amount of exposure to workplace conditions. This is in line with the holistic approach to competence development advocated by COMET.

Using these additional criteria to filter down the original COMET sample I was left with the industrial academies at an automotive manufacturer and a steel manufacturer. For ethical reasons I am precluded from identifying the two companies by name, therefore I will be using pseudonyms when referring to them. I have also included a detailed profile of both companies in the analysis chapter. The first academy is part of "Steel Foundry South Africa" (SFSA)[6], this academy is based in Gauteng and trains artisans in trades such as welding, boiler making, fitting and turning as well as instrument mechanisation. The second academy is part of "People's Cars South Africa" (PCSA)[7] is based in the Eastern Cape and specialises in trades related to automotive manufacturing and repairs. Further details and profiles of the participating institutions are provided in the analysis chapter.

Telephonic interviews were conducted with senior members of the respective training academies. These interviews were open-ended and oriented at gaining a comprehensive account of the training space at each of the institutions. The interviews were divided into three sections; processes related to learner enrolment, structure and content of training programme and post-training opportunities for graduates. Along with data generated through the interviews both SFSA and PCSA academies provided training documents articulating the training processes from enrolment to trade-test. Following the interviews and the systematic review of curriculum statements a comparative analysis of the training schedules from SFSA and PCSA was conducted. The two primary reasons for including these particular organisations in my study are; combined they contributed the biggest number of participants to the COMET study and the training approaches followed at these two academies differ slightly which provides a motivation for a comparative case study.

[6] Pseudonym of steel manufacturing company which participated in study
[7] Pseudonym of automotive manufacturing company which participated in study

Analysis

The statistical findings (from COMET) were initially processed and analysed through SPSS software. The data was sorted according the competence levels as defined by the 3 dimensional competence model (Rauner et al., 2012). This classification was applied for both individual learners as well institutional groupings. These statistics have been presented in the form of graphs. I have then substantiated on these statistics based on the conceptual model and provided an account of the potential implications for TVET institutions. Having provided a contextual foundation through the COMET data I then proceeded to build on it through the findings of the systematic review. A systematic review of various policy and training documents was conducted and the contents thereof were classified and arranged thematically. Applying COMET's three dimensional model as a framework for the systematic review the following themes were identified as key markers to classify findings;

- Curriculum Design
- Curriculum Objectives
- Curriculum Structure (syllabus)
- Prescribed Teaching methods
- Pacing and Sequencing
- Intended Outcomes

Conclusion

This study has been designed to follow a mixed methods approach for data gathering and analysis. When conceptualising the study this particular approach seemed to be the most relevant as it has enabled me to effectively triangulate findings from the mixed data sets in the form of primary data, statistics, curriculum and policy documents. This research study has drawn on the findings from the large competence diagnostics (COMET) study which was conducted by the MerSETA in 2011. 445 learners took part in the COMET study in South Africa, 300 of these learners also submitted biographical questionnaires. 80% of the learners and test takers were male, 20% female. These participants came from 6 different training institutions.

The starting point was reviewing the statistical breakdown of the COMET results; the test results of the individual learners who participated in the study as well as institutional

aggregates and trends. These statistics and findings were then used as a baseline from which the data collection instruments for this study were constructed. This particular data set was divided into categories; the first category was all the data and statistics related to individual learner performance and the second category was the data related to institutional competence trends. In this particular regard more emphasis was given to the data related to the performance of institutions as a whole rather than individual learners.

Once the trends and patterns identified in the COMET study had been established I went on to conduct a systematic review of the secondary data was conducted. From this synthesis of policy and training documents I was able to extract significant data concerning the design and implementation of training programmes. In this particular instance the focus was on the official curriculum for the discipline of Electronics across the two participating institutions. For purposes of conceptual consistency during the analysis process COMET's three dimensional model of competence was followed as a guide to assist in accurate categorisation of themes and trends identified in the findings.

When constructing this particular research study I took the decision to build on the findings of the COMET study, rather than to repeat the exercise, therefore the participants were purposefully sampled from the institutions which participated in COMET. However due to logistical and timeframe challenges the sample had to be narrowed down. A list of criteria was drawn up to filter those institutions even further, the final list of participants consisted of two institutions. I was left with the industrial academies at an automotive manufacturer and a steel manufacturer. Telephonic interviews were conducted with senior members of the respective training academies. These interviews were open-ended and oriented at gaining a comprehensive account of the training space at each of the institutions.

Chapter 4

Findings

The following chapter covers the presentation, discussion and analysis of findings generated by the COMET study. The chapter is structured into two parts. The first section provides an overview of the COMET study which was conducted in South Africa between August and October 2011. The overview also provides some background information about the institutions which participated in the study and where they rank as far as the competence benchmarking study is concerned. The second section provides a breakdown of the institutional competence profiles of the training academies of People's Cars South Africa (PCSA) and Steel Foundry South Africa (SFSA) as compiled from COMET data.

COMET Benchmarking

According to Rauner et al. (2012) COMET was developed to gain more insight into TVET's effects on a learner's development of occupational competence. He further states that measuring occupational competence is not intended as an alternative to any established forms of examination and testing (during the course of the training cycle or at its end). The intention rather is to develop a means to gain greater insights into strengths and weaknesses of TVET teaching and learning practices in relation to various forms of school-based and on-the-job training approaches. The competence model connects the guiding principles and objectives of TVET with the process of constructing test and learning content. COMET offers instruments to measure occupational competence that provide empirical data on how specific TVET systems are able to implement the fundamental principles of vocational education. The conceptual design of the COMET model can be applied across the whole spectrum of a TVET system; occupational competence, the development of vocational identity as well as occupational and organisational awareness (Rauner, 2007; 2005; Lave & Wenger, 1991). In order to achieve this COMET tools are designed to empirically measure competence levels of individuals and subsequently track their competence development trajectory throughout their training. The COMET test procedure is based on a three dimensional competence and measurement model which is used as a conceptual foundation to develop test instruments as well as to evaluate the test results (Rauner et al., 2012).

The COMET model measures competence on three levels; functional, processual and holistic shaping competence. The three level model is centred on the notion that competence can be ranked into levels according to increasing complexity in the application of work process

knowledge in the completion of occupation related tasks (this was discussed in great detail in the literature review). The competence levels are determined on the basis of learner performance in written learning and assessment tasks. The tasks are evaluated or rated according to eight criteria or competencies which provide a practical framework for distinguishing and elaborating the quality of test performance from one level of competence to the next (Rauner et al., 2012, Rauner, 2007; 2005). The eight criteria provide a qualitative aspect to the evaluation of test tasks.

The eight criteria (K1 – K8) are structured hierarchically to correspond with the three competence levels defined by the conceptual model of COMET. In other words, the COMET conceptual framework ranks the functional, processual and holistic shaping competence levels hierarchically. The framework further allocates each of the eight criteria to the corresponding competence level. The hierarchy structures the eight criteria as follows; technical criteria at the bottom, followed by organisational and occupational criteria in the middle and intellectual criteria at the top.

During the evaluation (marking) process of the test or learning task criteria ranked lower down the hierarchy, such as functionality and clearness, are evaluated before those that are ranked higher up on the hierarchy. If the learner has met the necessary requirements for a particular level then the evaluation proceeds to assess the task according to the criteria for the next level of competence. This somewhat pedantic approach to evaluating test and learning tasks is applied because of the emphasis placed by the COMET framework on the learners' understanding of the complete scope of activities involved in the work process. The eight criteria represent the core competencies identified by Rauner (2007; 2005) as being crucial in facilitating an individual's development from novice to expert in their chosen occupational field. The eight criteria described below have been developed and compiled by Rauner over several years of research and developing curricula for various courses offered in Germany's TVET system. The eight criteria are defined as follows:

Clearness/presentation (K1):

A core element of communication in the work context is the ability to express one's thoughts in a clear and organised way by giving accounts, drawings and sketches. Thus the explanation and presentation of test solutions is an instance of occupational learning in preparation for professional work. The adequacy and the manner in which learners grasp and disseminate their ideas related to the solution of work related tasks provides an indication of the learners'

level of professionalism. The object of the COMET test task in this regard is to test the ability of learners to clearly articulate themselves in an occupational context and their ability to present technical information.

Functionality/operability (K2):

Functionality refers to the instrumental, technical competence or the context-independent knowledge and skills specific to a particular subject. Evidence of the functionality of a solution is fundamental to the credibility of solution amongst practitioners. The functionality of the proposed solution determines whether or not further requirements that are posed for the solution of work tasks are relevant to the solution. The functionality of a proposed solution is central to its success or failure. Thus functionality tests for the technical soundness and legitimacy of proposed test solutions by learners.

Sustainability/utility (K3):

The criterion of utility primarily focuses on the utility of a solution in the entire context of the work process. Professional activities, workflow, work processes and work assignments are ultimately oriented towards a customer, whose concern is the use value of the work result. A high utility of a solution depends not only on its immediate applicability for the customer, but also on the prevention of liability to failure and the consideration of aspects of easy maintenance and repair. Sustainability of application and the perspectives for enhancement must also be taken into account when the utility is assessed. This particular criterion builds on the functionality criterion, over and above the immediate utility of the solution is the question of how long that particular solution is likely to remain functional. Thus learners are assessed on whether or not they have considered and made provision for the long term application of their proposed solution.

Efficiency/effectiveness (K4):

The context-specific consideration of economic aspects in the solution of professional tasks is a characteristic of the competent activity of professionals. There is a constant necessity in professional work to evaluate how economically a task is carried out, and to consider quite diverse types of costs and influences. Costs that will be incurred in the long run (derivative costs) need to be taken into account as well. In addition, economic responsibility also includes an awareness of the societal aspects as not all strategies that make sense at the organisational level may also be acceptable for the national economy. In the assessment of

this particular criterion a key element is the consideration of the cost/benefit ratio of the proposed solution, whether or not the learner presents the most cost efficient solution.

Business and work process orientation (K5):

This criterion refers to the preceding and the succeeding operations in the organisational hierarchy and in the production process chain. This aspect is particularly relevant in an environment characterised by programmed work systems in networks in and between companies. A business process oriented solution takes into account the linkages with the preceding and following processes and includes also the aspect of cooperation beyond the boundaries of one's own professional work. Solutions in this regard test for the learner's awareness of organisational processes and how these processes might affect or be affected by their proposed solution.

Social acceptability (K6):

This criterion refers above all to the aspects of a humane organisation of work, health protection as well as the social aspects of professional work that go beyond the work context. This includes aspects of work safety and prevention of accidents as well as the potential impact of a specific solution on the social environment. This criterion extends to factors beyond the classroom or the workplace environment. Learners are assessed on whether or not they have considered the social implications of their solutions; whether their solution shows consideration for labour and sourcing of raw materials for production process.

Environmental compatibility (K7):

What is being considered here is not the aspect of environmentalism in general, but the professional and technical requirements for professional work processes and their results that can be considered relevant for the criteria of environmental compatibility. It has to be taken into consideration whether environmentally friendly materials are used and whether an eco-friendly work organisation is followed in the solution of the work task. Other issues that need to be considered in the proposed solution are; energy saving strategies, aspects of recycling as well as environmental impact.

Creativity (K8):

The creativity of a solution is an indicator that plays an important part in professional problem solving. This is due to the fact that the room for manoeuvre for the solution of

professional tasks varies strongly in the different work contexts. The criterion of a "creative solution" has to be interpreted and operationalised in an occupation-specific way. In the arts and crafts, creativity is a core aspect of professional competence. In other domains the aspect of "creative solution" is a relatively independent concept of professional work and learning. The distinction of creativity in a specific solution also shows the sensitivity for the problems to be solved. Competent professionals are expected to find innovative and unusual solutions which at the same time make a meaningful contribution to the attainment of the goal.

COMET Benchmarking: Institutional Analysis

PCSA and SFSA are two of the five institutions which participated in the COMET study of 2011. Both PCSA and SFSA were selected to be part of the study for a number of reasons, one of which was their dual role as training provider as well as employer. These two companies have the largest numbers of learners within their respective sectors and have significant representation on various platforms and forums which shape teaching and learning within the respective sectors. Moreover they continuously provide their learning spaces and learners for MerSETA research initiatives (AMSA, 2014; VWSA, 2014a). For the COMET study SFSA and PCSA were the two anchor institutions and combined they provided the most number of learners. In this section I will be interrogating the institutional competence profiles of these two institutions, emphasis will be placed on understanding the relationship between these competence profiles and the training models followed at these two institutions. As indicated in the previous section the two models are CBMT (PCSA) and Time-Based Apprenticeships (SFSA).

As far as Rauner et al. (2012) observed there was no significant difference in the institutional competence profiles across the sample. The institutional profiles were constructed by aggregating the test scores of individual learners per institution. The most significant finding as far as the institutions are concerned is that learners receiving their training within in-company training academies are less likely to fall into the "risk group" of nominal competence in comparison to their counterparts in TVET Colleges. The risk group was described as those learners who attain a competence level that is not adequate enough for them to be considered as being ready to practise within their occupational fields. This is mainly attributed to the fact that learners training within a company setup have a greater awareness of organisational dynamics and their role within the organisation. Rauner et al.

(2012) provide the following explanation; learners being trained in TVET Colleges and UoTs may not develop their competence as rapidly as they only have a theoretical basis of their occupational and organisational roles. On the other hand those that receive their training within a work environment have a contextual understanding of what is expected of them. This trend is supported by Lave and Wenger's (1991) situated learning theory, they argue that the most effective learning environment is within a community of practice. This means that their occupational expectations are located within a context and this (contextual grounding) according to Rauner et al. (2012) is a significant factor in accelerating the individual learner's competence development. Furthermore Rauner (2007; 2005) argues that competence development is linked to a concept he calls vocational identity and organisational commitment. In this instance learners in institutions which do not provide them with conditions similar to the workplace environment are more likely to develop technical competencies slower than their counterparts in industrial academies.

The graphs below represent the institutional competence profiles of PCSA and SFSA, these profiles provide a graphic breakdown of competence levels attained per institution. These institutional COMET profiles serve as an ideal starting point for interrogating teaching and learning processes at the two institutions. Utilising the COMET profiles, curriculum statements and questionnaire data I will conduct a comparative analysis of the SFSA and PCSA academies. In this regard the focus will be placed on the respective curricula and training models utilised by the two institutions.

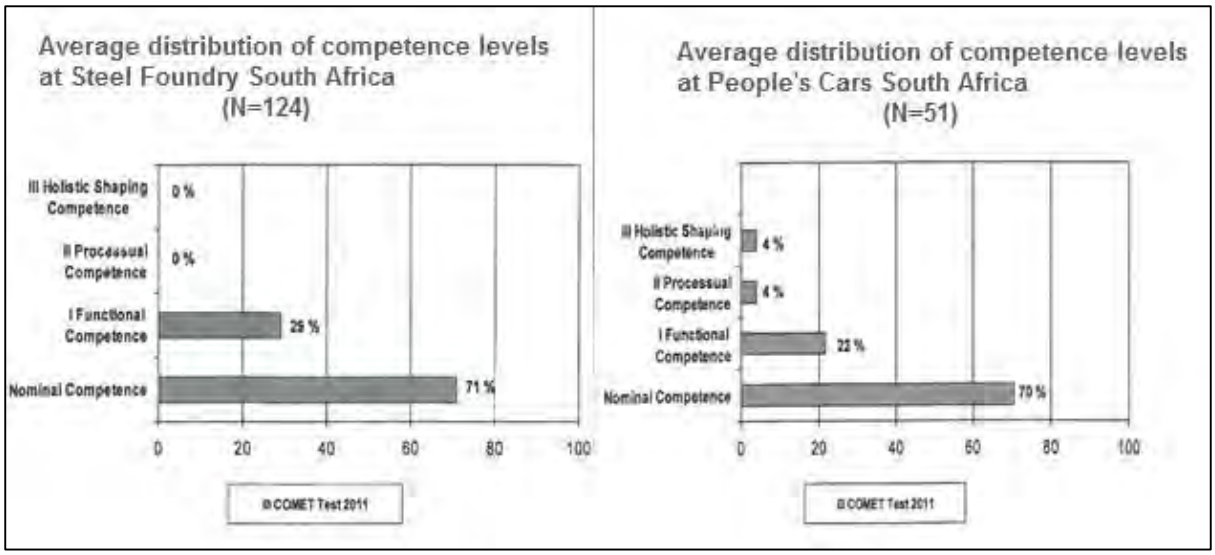


Figure 6: Graphic representation of institutional performance in COMET testing, this is based on the average test scores of learners who took the COMET test from each institution. Source: COMET Statement of Results (Rauner et al., 2012)

According to the above profiles a majority of the learners who participated in COMET testing were classified as being nominally competent. The precise reason for the concentration of learners at this level of competence is unknown and the biographical information of the learners is incomplete. What the profiles also indicate is that a significant portion of learners within each institution are situated at the level of functional competence. This could be attributed to a curriculum which focuses on developing learners for specific occupational tasks. One of the other trends which emerged in the COMET study findings is that across both institutions learners reach a plateau in their competence development after their second year of training. This is a particularly significant finding as the training programs offered at these institutions run for more than two years per cohort. Which begs the question, if learners are not developing any new competencies after their second year of training, is there a need for a curriculum which runs for longer than two years? It could be argued that this trend is symptomatic of teaching and learning which emphasises process and formulas and limits learners engaging with the content of the curriculum. This is contrary to what Rauner et al. (2012) as well as Rauner (2007; 2005) propose in the three dimensional model of competence. Rauner (2007) as well as Gamble (2013) argue that in order to develop holistic professionals, institutions must design teaching and learning processes which will allow learners to engage with the content of the curriculum and develop their own strategies in solving occupational tasks. Furthermore those learners who attained processual and holistic shaping competence (8%) are all concentrated in one institution (PCSA).

According to Rauner's (2007; 2005) three dimensional competence model this trend is a symptom of teaching and learning processes which emphasise "book" knowledge over work process knowledge. This is attributed mainly to the emphasis on the theoretical understanding of subject material during the teaching and learning process. In general, the COMET study found that "reflected work experience" is one of the most important triggers for competence development. Broadly defined reflected work experience is learning which takes place within an occupational environment and utilises work processes to develop learner competence (Rauner et al., 2012). However all the statistics generated by COMET do not provide an indication of how this reflected work experience is acquired or how learning should be structured by institutions as the study only gives limited insights in the actual teaching and learning processes that take place at the level of the classroom. Furthermore COMET findings indicate that trends related to competence development at an institutional level are similar across the sample groups regardless of gender, age and level of training. In this regard

the COMET instrument measures competence on two levels. Firstly it measures the overall competence level of a learner (functional, processual or holistic shaping) based on the total score achieved in the test. Secondly the test instruments serve as a diagnostic tool to measure the extent to which certain competencies (K1 – K8) have been exhibited by the learner in completing the test. The results are presented in the form of radial graphs which represent learner profiles. The implication of the above mentioned findings therefore is that learners from the same institutions are most likely to develop more in similar competencies even if the levels of competence they attain may differ. Thus one of the factors one has to consider in more depth is the curriculum and more specifically how the curriculum is structured and implemented at PCSA and SFSA academies.

Conclusion

The findings of the COMET study provide a unique perspective on the development of competence amongst learners within South Africa's TVET system. The greatest concern emanating from these findings would be that the majority of learners were not able to attain the lowest level of competence stipulated by the COMET model. Due to the limited statistical insight provided by these results it can only be speculated as to what the contributing factors are for this trend. In this regard qualitative studies focusing on teaching and learning processes within the various institutions still need to be conducted. It is also worth noting that the remainder of the participants (those who statistically scored higher) are concentrated at the functional level. This raises critical questions concerning the role of the curriculum and how it is applied within these institutions. It is this particular concern that provided the motivation for my study of the curriculum and its relationship with competence development. In this regard I have subsequently engaged with SFSA as well as PCSA to further probe some of the institutional dynamics which play a role in shaping the development of competence of learners within these two institutions.

Chapter 5

Institutional Approaches

The following chapter explores the institutional dynamics of curriculum implementation and competence development. The section profiles two institutions who participated in the COMET study and provided the largest number of participants for that study. These two particular institutions provide interesting case studies as they occupy the dual role of being an employer as well as a training provider. The particular models being profiled in this particular instance are the Competency Based Modular Training (CBMT) and Time-Based Apprenticeship (apprenticeship) models. These training models are the most widely followed training approaches within the automotive and manufacturing sectors in South Africa. The third section covers the discussions and analysis of the findings of the study. The discussions focus particularly on the links between how curriculum is understood and its implications on competence development at the institutional level.

Steel Foundry South Africa

Steel Foundry South Africa [SFSA] Limited is the largest steel producer on the African continent; approximately 78% of domestic market share. The company has a long history of operations in South Africa, SFSA has six operational plants across the country. SFSA employs approximately 10 000 people across all is operations, 90% of which is permanent staff (Kriel, 2011). As one of the biggest employer companies in the country SFSA has invested a significant amount of money in skills development, training artisans for the national pool. In this regard the company has revamped its training strategy to align with the global objectives of the Steel Foundry Group International[8]. Through this association SFSA has access to world-class research and development as well as best practice processes (AMSA, 2014; Harrison, 2013; Kriel, 2011).

Steel Foundries Engineering Academy[9]

SFSA has a long tradition of providing quality technical training within South Africa's labour market, and their training pedigree has been significantly raised with the establishment of the Steel Foundry University. The university is part of SFSA's global operations and is part of an initiative to improve the company's efficiency and productivity through the development of

[8] Pseudonym for ethical purposes
[9] Pseudonym for ethical purposes

employees (AMSA, 2014). According to Harrison (2013) SFSA plays a significant role in strengthening the corporate culture of the company and advancing careers of employees. The University groups many of its courses into academies, which help to pull together the best and most efficient teaching to promote excellence. The university is divided into 10 functional academies, which are designed to provide knowledge and resources for specific functions of SFSA's business. Each runs courses of various lengths and levels, from short introductions on the subject area to in-depth studies on niche aspects of each field. Academies cover areas such as leadership, management and e-learning, as well as 'functional' sectors such as steel, finance, IT, research and development and sales and marketing, legal, health and safety, internal assurance, human resources and purchasing. The academies play a key role in identifying, nurturing and allowing talent to flourish, particularly through the 'talent pipeline' programs (AMSA, 2014).

For the purposes of this chapter the focus will not be on the global operations of the Steel Foundry University but specifically on the training activities at SFSA's Engineering Academy. However it is critical to note that with their footprint on the global market it is vital for SFSA to ensure that their skills development mechanisms develop individuals of a high calibre. SFSA's Engineering Academy provides training programs for artisans, technicians and engineers. The academy also offers courses for individuals to convert from a lower level of occupational designation to a higher one (e.g. artisan to technician conversion). All programs located at the artisanal level are coordinated completely by the engineering academy whilst those at the technician and engineer levels are offered in partnership with surrounding UoTs. In instances where this is the case the engineering academy offers the practical and experiential components of the program and the UoTs the conceptual and theoretical parts. All training programmes offered by the SFSA Engineering Academy are accredited by MerSETA (AMSA, 2014).

Entry Criteria

SFSA recruits their learners from a number of various institution types, secondary schools, TVET Colleges as well as UoTs. As indicated briefly above SFSA's Engineering Academy offers training programs at different levels, the apprenticeship programs being at the lowest level. For this particular study the focus was on the apprenticeship programme as it is a sector-wide programme monitored by MerSETA. Questionnaire data indicates that learners for the apprenticeship are selected after they have successfully completed their matric

(National Senior Certificate) qualification or their National Curriculum Vocational (NCV) level 4. All learners selected must have passed their matric with Mathematics, Science and English at a minimum of 50% plus two trade related technical subjects, the same 50% pass criteria applies for candidates with technical qualifications from an accredited college (N1 - N6 or NCV).

A senior member of the engineering academy stated on the questionnaire that candidates who meet the academic criteria take further psychometric assessments to determine their technical and learning capabilities. These psychometric tests are compiled and implemented by the institution. These psychometric tests evaluate a learner's aptitude for the types of occupational activities and roles which they are likely to fulfil within the organisation. Candidates by law are also required to undergo and pass a physical examination before they are registered on any of the training programmes at the Engineering Academy.

Program Structure

SFSA Engineering Academy runs a number of training programs of which the engineering apprenticeship is the most popular. Apprenticeships are offered in a number of occupations such as; boiler making, welding, electro-mechanics (millwright) and electrical engineering (AMSA, 2014).

The apprenticeship runs for a minimum of 80 weeks up to a maximum of four years, this is a legal stipulation which is enforced by the MerSETA (MerSETA, 2009b). The format of the apprenticeship is time based with the trade test being the summative assessment for the program. The apprenticeship covers NQF levels 2 – 4, however (due to the design of the training model) the sequencing and pacing of tasks and learning activities is not rigidly aligned to the structure of modules and courses as they are listed on the NQF. The design of time based apprenticeships is comprised of various unit standards and modules and learners are required to complete learning and assessment exercises within a prescribed amount of time; which is stipulated in either weeks or hours. The modules which form the apprenticeship programme are divided into four phases, at the end of each phase the learner is assessed and their training record is submitted to MerSETA. Once all the phases of the programme have been completed and signed off in the learners' logbooks the logbooks are submitted to MerSETA with trade test applications (MerSETA, 2009b). Moreover questionnaire data indicates that SFSA have implemented the following measures to ensure

that learners maintain their progress and attain learning milestones. Learners are required to produce portfolios of evidence for class and plant activities simultaneously with their phase tests. Due to the nature of the apprenticeship programme the learner's logbook becomes a critical component of the training approach. The logbook serves as a portfolio of evidence for external stakeholders, such as MerSETA, that the necessary curriculum has been covered. One of the senior instructors at SFSA's Engineering Academy indicated through the questionnaire that the portfolios of evidence as well as phase tests are used as a means to provide learners with feedback on their development and progress within the programme. This feedback is administered by mentors who are assigned to the learners by the academy. According to SFSA and government regulations, regardless of the level of qualification that a learner holds when entering the institution, they have to take the compulsory health and safety as well as plant induction courses (AMSA, 2014).

Through questionnaire data it was established that whilst learners are going through the induction courses (which include health and safety as well as plant orientation modules) they complete six months of compulsory institutional training; this forms part of MerSETA regulations for apprenticeships of this kind (MerSETA, 2009b). During this period learners are taught the fundamentals of their occupation and receive practical training in a simulated, workshop environment. Once the minimum time of institutional training has been covered learners are transferred into the workplace where they are exposed to the work environment and perform work related tasks under the guidance of mentors and supervisors. Learners' exposure is structured incrementally, from their 2nd year of training onwards. By the end of their fourth year of the apprenticeship they are exposed to 75% of plant related tasks where their work is linked to the company's production activities. Learners become eligible for their trade test after a minimum of 80 weeks, if successful they serve a 12 month probationary period as a candidate artisan. The questionnaire indicates that if successful with their trade test, learners even though they may have the necessary credentials to work independently SFSA has adopted a policy of the candidate artisan. Candidate artisans are monitored during this period. According to national legislation learners have three attempts to successfully complete their trade test (MerSETA, 2009b).

Curriculum

As with most MerSETA accredited institutions, Steel Foundry South Africa Engineering Academy's course material is prescribed and quality assured by the MerSETA. The table below shows a breakdown of the level 2 modules for the electro-mechanics (millwright) course.

Electro-mechanics - NQF Level 2

NLRD # 58269: National Certificate: Electro-mechanics

Electro-mechanics-specific Modules

Module Ref	Module Title	Topic Title	Unit Standard
2-EM-M01-T01	Basic Hand tools	Select Use and care for engineering tools and measuring equipment	12476; 119744; 12219; 243783
2-EM-M01-T02	Basic Hand skills	Basic Engineering	13297; 9881; 10784; 13214; 243782
2-EM-M01-T03	Basic Hand Skills	Welding, brazing and cutting	114669; 114616; 113863
2-EM-M02-T01	Fundamentals of Electricity	Electricity Fundamentals	113877; 10237; 10254
2-EM-M02-T02	Fundamentals of Electricity	Electricity Application	10233; 10624; 10626; 10253; 10254; 10603; 113858; 10261; 14134
2-EM-M02-T03	Electricity Fundamentals	Basic Circuitry	11954
2-EM-M02-T04	Fundamentals of electricity	Electrical testing and inspections	110404
2-M03-T03-T01	Lubrications, bearings and seals	Lubrication	243769
2-EM-M03-T02	Lubrication, bearings and seals	Bearings	243769; 243780; 12383; 243781
2-EM-M03-T03	Lubrication bearings	Seals	13219; 13279
2-EM-M04-T01	Basic Engineering Support	Principles of transfer	243762

Electro-mechanics-related Modules

Module Ref	Module Title	Topic Title	Unit Standard
2-ARM-M03	Conduct an automotive service	Automobile service	243769
		Battery service	
2-EF-M01	Mechanical technology	Safety considerations in the work environment	13214
		Effectively cut, punch and drill fabrication material	
		Quality and reporting requirements for cutting, drilling and punching	
2-FP-M02	Introduction to hydraulics	Principles of hydraulics	24686 ; 13219
2-LIM-M04-T01	Basic Electrics	Install electric wire ways	10253
2-PT-M01-T01	Maintain and repair	Maintaining and repairing equipment	13221
3-F-M03-T01	Maintain direct and indirect drives	Direct and indirect drivers	13216

Table 1: Breakdown of modules in the level 2 millwright course as prescribed by MerSETA Courseware Catalogue (MerSETA, 2012, pg 35)

Cross-cutting Generic Modules

Module Ref	Module Title	Topic Title	Unit Standard
2-G-M02-T01	Drawing and measuring	Engineering drawing	12215
2-G-M02-T02	Introduction to hydraulics	Hydraulic components, hose, connectors, and fitting	12476; 243780
2-G-M04-T02	Working with materials	Using tools	119744
2-G-M05-T02	Learning tools and techniques	Use of computers in the workplace	116932

Table 2: Breakdown of level 2 generic modules for millwright course as prescribed by MerSETA Courseware Catalogue (MerSETA, 2012, pg 36)

As mentioned briefly in the previous section, the apprenticeship curriculum at the academy is divided into four phases. Moreover this particular curriculum is not aligned to the calendar year. Due to the time-based nature of the model, progress is dependent on the individual learner or cohort and how long it takes them to complete the tasks. This is in contrast to similar courses that may be offered at a TVET College which run according to the calendar year. According to MerSETA (2009b) implementation policy for time-based apprenticeships, this particular model requires learners to log a certain number of hours or weeks on a particular unit standard or task. Once the learner has completed the stipulated amount of time and demonstrated a certain level of competence on the task the supervisor or mentor signs off in the learner's log book, the learner may then proceed to the next set of tasks within the course. With the course being divided into four phases learners are required to complete an assessment at the end of each phase demonstrate that they have developed the necessary competence to progress to the next level of modules and unit standards. Although the phase tests play a role in determining learner progress, there is no qualification awarded at the end of each phase of the programme. When a learner has completed a minimum of 80 weeks and signed off on all the required unit standards they can apply to take their trade test (MerSETA, 2009b). Upon successful completion of the trade test learners are awarded a trade certificate.

According to Rauner's (2007; 2005; Rauner et al., 2012) three dimensional model of competence, the separation of institutional training and workplace training into two separate components of the teaching and process creates a limitation for the development of holistic competence amongst learners. This is problematic in two parts; firstly by separating disciplinary knowledge from work processes leaves teachers and instructors with limited opportunities to provide learners with meaningful feedback regarding the development of

their competence profiles. By combining theoretical knowledge of the subject with an understanding of work processes learners are able to develop a deeper understanding of the field and develop more effective approaches to applying themselves during the work process. Secondly, if the focus of the training becomes successfully completing the trade test it arguably creates a bias towards emphasis on occupation related competencies at the expense of disciplinary knowledge or conceptual competencies. This could also potentially lead to teaching and learning that is oriented towards merely preparing learners to take their trade test as opposed to holistic mastery of the subject area (Allais, 2011). This arguably limits the developmental potential of the learner as their grasp of the subject is fragmented between theoretical understanding of the subject and its application in the occupational space. This has a potential impact on the development of holistic shaping competence. Perhaps one of the most significant challenges with this particular training model is that the trade test (which is a summative assessment) becomes the primary basis upon which qualification is awarded. Besides the trade certificate there is no other form of accreditation given to the learner to acknowledge the competencies which they have developed during the course of their training. The trade qualification limits the learner to an industrial environment with few opportunities to access further learning at other types of institutions.

Learner Support

According to questionnaire data, the following measures have been put in place by SFSA to ensure optimal development of their learners:

Mentors and coaches are allocated to all successful applicants. The mentors are responsible for academic and personal guidance for learners. Along with the mentors, coaches are allocated to each cohort of learners when they begin their workplace exposure. The coaches, who are subject matter expects, are allocated to help the learners fit in at the plant where they will be working with teams of artisans and technicians. The coaches provide day-to-day support and have weekly follow-up and feedback sessions with learners to ensure a high level of work performance. The company website states that a Young Professionals Forum (YPF) has also been established. The forum creates a vehicle for technical and business related information sharing amongst learners and instructors, to promote the different technical disciplines and to offer general assistance with regard to work related problems (AMSA, 2014).

Conclusion

SFSA has one of the longest and reputable records in South Africa when it comes to teaching and learning across various TVET disciplines. Over the years they have created and maintained a culture of teaching and learning based on the traditional concept of apprenticeships which has established them as one of the leading engineering academies in their sector. Through their expertise in the manufacturing sector SFSA has created an environment at the academy where learners can be moulded according to the company's needs. With the academy providing a labour pool for SFSA it places the company at a distinct advantage when it comes to shaping the curriculum to respond to the company's needs. The training undertaken by the SFSA Engineering Academy serves not only the skills demands of the company but also contributes artisans towards the national pool. Due to SFSA's significant market share and their influence within the manufacturing sector this means that artisans who are deemed a surplus to requirement at the company are readily absorbed by other companies in the sector. What the findings of this study indicate is that from a teaching and learning perspective, even though comparatively they have some way to go in developing the types of competencies prescribed by COMET, SFSA has set-up the necessary structures within their training programmes to ensure that their candidate artisans are prepared for the workplace. Moreover it is worth noting the significant role played by SFSA in shaping TVET policy in the country through their participation on various policy forums. SFSA's participation in the COMET study should be commended as it serves as an indication of their willingness to open up their facility and training approach to empirical scrutiny.

People's Cars South Africa

People's Cars South Africa [PCSA] employs approximately 6 000 people across their manufacturing, sales and services departments. The company owns a network of automotive dealerships across South Africa as well as a manufacturing plant located in Uitenhage. PCSA is a major role-player in South Africa's automotive sector; they hold a significant portion of the market share and they invest significant portions of their profits into the development of their employees. Due to their market share in the automotive consumer market they are able to finance a number programs which are aimed at improving the skill levels of their workforce. These programs include entry level training courses for those interested in

pursuing a career in the automotive sector as well as courses designed to continuously upgrade the skills of their active workforce (VWSA, 2014a).

People's Cars Learning Academy[10]

In 2008 the PCSA Learning Academy was officially launched in South Africa, the role of the academy is stated as providing advanced training for employees of PCSA. Moreover the Learning Academy also provides business training services to local suppliers and businesses. The facility is based in Uitenhage at the PCSA Manufacturing Plant, the academy is divided into five units. These five units specialise in production, leadership, technical, commercial and sales as well as marketing; the units are supported by a learner management system that is in line with the latest technological developments. PCSA's Learning Academy is accredited by the MerSETA and the training programs on offer are aligned to South African Qualifications Authority [SAQA] requirements and the NQF. Each academy across People's Cars global network offers its own structured learning path for individual learners (VWSA, 2014b). For the purposes of this discussion we will focus on the learning that takes place in the Learning Academy's technical unit.

Entry Criteria

PCSA offers a number of training programs within their technical unit, which include specialisations in mechatronics, motor mechanics, tool making and engineering. The entry criteria differ depending on the level of training and the specialisation a learner is applying for (VWSA, 2014b). According to data collected through the questionnaire, PCSA has made provision for learners entering the academy from various institutions of learning, the minimum requirement being that the learner must have obtained above 50% in the compulsory subjects at the appropriate exit levels.

[10] Pseudonym for ethical purposes

Matric (from school):	From Technical institutions (TVET College, UoT):	
Mathematics Engineering Science	Mechanical:	Electrical:
	Mathematics Engineering Science Engineering Drawing Industrial Orientation Fitting and Machining Theory Mechanotechnology	Mathematics Logic systems Industrial Electronics Engineering Science Electro-technology

Table 3: Subjects required for entry into PCSA Learning Academy (VWSA, 2014b)

The questionnaire further indicates that candidates who meet the minimum academic requirements are further evaluated and screened through psychometric assessments and individual interviews. In the questionnaire a senior member of the academy stated that over and above academic and technical abilities the top four characteristics they look for when interviewing and assessing potential candidates include; attitude, flexibility, responsibility and being goal oriented. This possibly distinguishes PCSA's training approach or culture from other training providers in their sector.

Program Structure

The PCSA's Learning Academy's Technical Unit offers training programs for learners pursuing specialisation as artisans and technicians.

A training guide obtained from the learning academy shows that at the artisan level training is divided into three levels which correspond with NQF levels 2 – 4. Each level consists of approximately 45 weeks of teaching and learning, this includes company and occupation orientation, theoretical and practical training as well as assessment. The training guide goes on to provide details on the curriculum at each level and how it is divided into three components; core, fundamentals and electives. Each of these components consist of various SAQA accredited unit standards (these may differ from programme to programme). Through the questionnaire it was established that the training model provides Work Integrated Learning with different amounts of workplace exposure at each level. At level two learners are given 20% exposure to work related tasks, level three 50% and at level four 75%. The questionnaire further shows that learners conduct practical tasks in a simulated environment with close supervision from instructors. Learners complete summative assessments at the end of each level and are awarded certificates if they display the necessary competence. At the

end of level four learners complete a 10 week training course preparing them for the trade test. Upon successful completion of the trade test learners are granted the necessary credentials to practise independently.

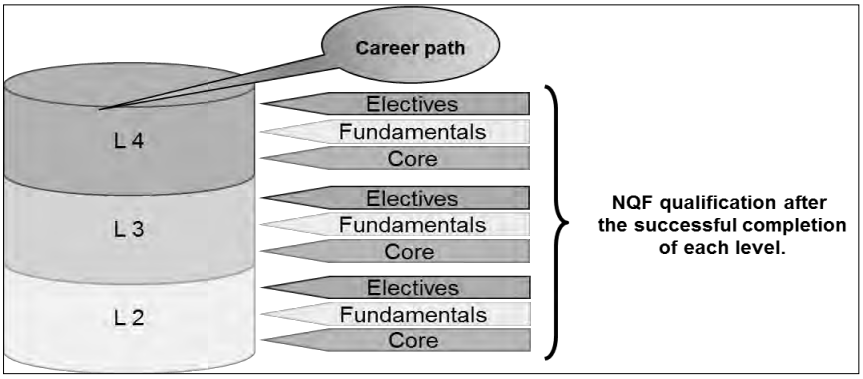


Figure 7: Breakdown of PCSA's training structure (VWSA, 2014b, pg 2)

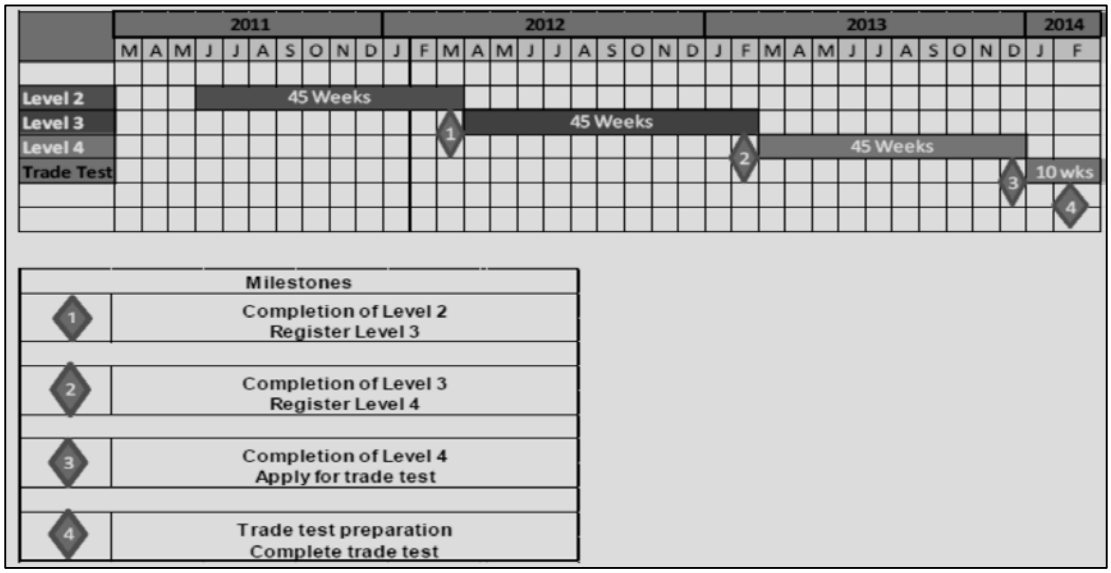


Figure 8: Breakdown of training time per level (VWSA, 2014b, pg 6)

Curriculum

The training programs offered at the PCSA Learning Academy follow the Competency Based Modular Training (CBMT) model (VWSA, 2014b; MerSETA, 2009c). According to the MerSETA (2009c) guide on the implementation of CBMT programs; each training program must consist of a minimum and maximum time frame per level. The progression of a learner from level to level is dependent on them displaying the necessary competence in completing the theoretical and practical tasks of the assessment. National legislation dictates that each

learner is allowed three attempts to complete level tests, however this may also be determined by the training agreement between the learner and the academy (MerSETA, 2009c).

Learners are required to undergo upfront institutional training (theoretical instruction) in their occupational field. Learners attend classes five times a week, this is split between the classroom and the workplace. Figure 9 (pg 90), provides a breakdown of fundamental, core and elective unit standards for the NQF level 2 Mechatronics course. Through work integrated learning, the learners are able to consistently apply their theoretical training in the workplace. A significant factor to consider about the CBMT model is that the curriculum focuses on teaching and assessing a set competencies over a concentrated period of time before proceeding to the next set of competencies. At each level once the course material and in the minimum number of hours have been logged in the workplace the learner becomes eligible for a level test. If found to be competent the learner is required to commence with the next level of training the following day. In the case of level 4 learners they enter a program to prepare for their trade test (MerSETA, 2009c).

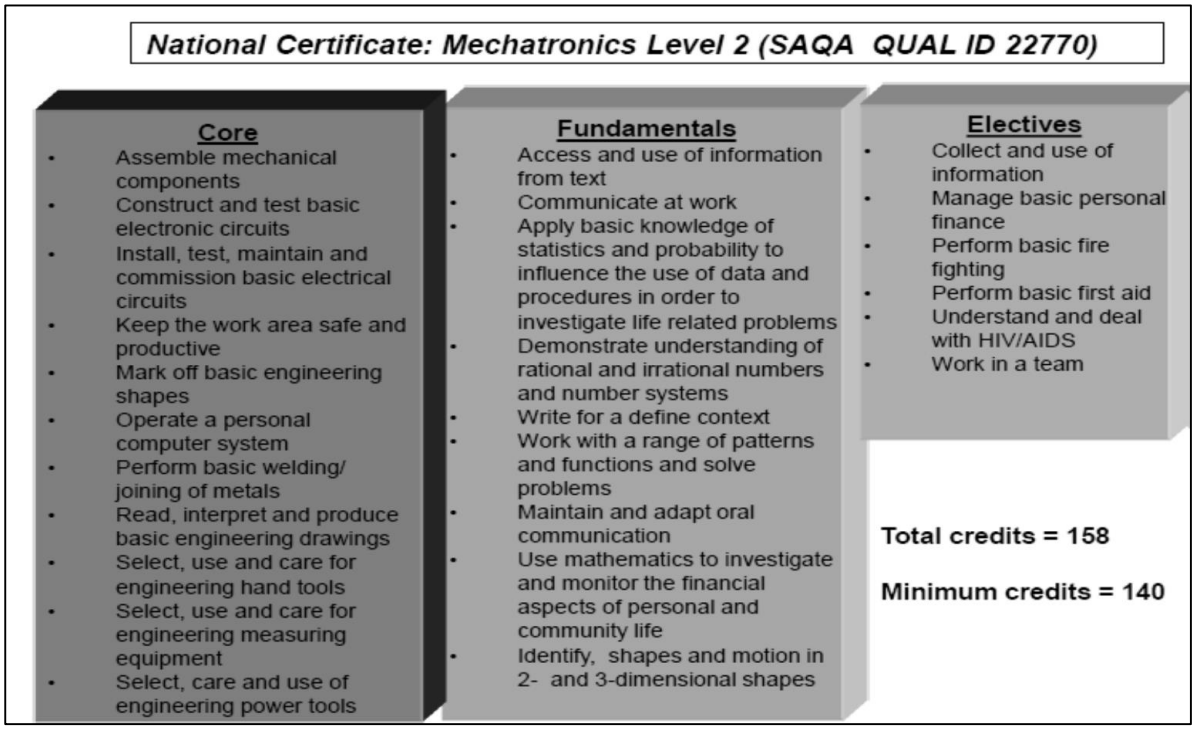


Figure 9: Breakdown of curriculum content offered at PCSA Learning Academy. This particular example is a breakdown of the Mechatronics NQF level 2 qualification (VWSA, 2014b, pg 3)

Learner Support

According to questionnaire data a learning and development forum has been established at the Learning Academy to provide support for the learners. This forum meets every two weeks to discuss teaching and learning as well as learner related matters. Each cohort of learners at the academy is assigned a mentor and a work supervisor; the ratio of mentors per group is stipulated in the MerSETA training regulations. Once the learner has been registered at the academy they are placed in a corresponding unit in the manufacturing plant. Mentors are responsible for the following;

- Monitor learners' progress,
- Provide learners with feedback and assistance in reaching learning objectives,
- Plan and manage learner schedules,
- Collaborate with production unit for effective learner placement

A senior member of the academy indicated through the questionnaire that mentors form an integral part of the academy's strategy to immerse learners into the culture of the organisation as well as help with the transition into the working environment.

Conclusion

PCSA and SFSA play significant roles in their respective sectors and play significant roles in shaping South Africa's skills development agenda. Out of the two organisations PCSA exhibits a willingness to be innovative in their approach to teaching and learning. This could largely be attributed to the rapid changes occurring in the automotive sector due to constant advances in technology. Part of their involvement in shaping South Africa's TVET landscape has lead them to take part in various initiatives aimed at improving the quality of teaching and learning in TVET. Their involvement in the COMET study provided an empirical means to gauge the competence levels they are able to develop amongst their learners based on an international benchmark. It is worth noting that their training approach is the closest example in South Africa of the German approach of parallel classroom and workplace learning.

Chapter 6

Discussion and Analysis

The dual role of training provider/employer played by both organisations places them in a unique position to engage with the various dynamics of curriculum implementation and competence development at an institutional level. Overall through the COMET study Rauner et al. (2012) present quite a detailed cross-section analysis of the institutional dynamics of competence development across the two institutional approaches of PCSA and SFSA. In as much as the COMET study does not provide detailed insight into the Teaching and learning dynamics within both institutions, it manages to frame the subject of curriculum and competence in a unique manner. The COMET model provides a mechanism which empirically diagnoses and analyses the teaching and learning in terms of inputs, processes as well as outcomes. Thus the next step for the purposes of this particular study would be to interrogate how the relationship between the curriculum and competence plays itself out at both academies in more detail.

Rauner et al. (2012), Gamble (2013) and Allais (2011) note and emphasise that the context within which teaching and learning processes take place is a significant factor in shaping the awareness learners have of occupational demands and expectations. This awareness then serves as a catalyst for the development of the learner in any given occupational field. The environment provided by the academies at SFSA and PCSA offers learners an insight into the world of work that their counterparts from strictly academic institutions do not have. Learners from these institutions indicated that they understood what was expected of them from an organisational point of view. This understanding was exhibited in the fact that they were able to articulate their roles within the organisation better than their counterparts from other institutions. From a labour market point of view this places learners from industrial academies at a competitive advantage when it comes to job seeking. It must be noted however that the COMET study did not cover the specific subject of curriculum and the various dynamics which might influence its implementation at an institutional level. Thus the further research I have conducted exploring the peculiar role of the curriculum within TVET institutions in South Africa was aimed at gaining greater insight into the institutional dynamics of PCSA and SFSA. Using the COMET framework as a starting point I have interrogated the training models utilised at these two institutions, focusing on how the structuring and pacing of the curriculum may be potentially linked to competence development amongst their learners.

Training Model Analysis

The overall conclusion made by Rauner et al. (2012) concerning the competence profiles attained per institution is that there are no significant differences in the development of competence across the South African sample. The average profile of all institutions within the South African sample seems to indicate a curriculum that places a high emphasis on functional aspects and of occupational knowledge. However the differences that are observed in the levels of competence exhibited (on an individual basis) do raise some critical questions about the efficiency of certain training models and approaches in facilitating the growth of work process knowledge amongst learners. For the purposes of this discussion the focus has been narrowed down to two models in particular, CBMT at PCSA and Time-Based Apprenticeship at SFSA. These two models are coincidentally two of the most widely used training models across South Africa's automotive and manufacturing sectors as SFSA and PCSA are significant role-players within these sectors (AMSA, 2014; VWSA, 2014). Discussions concerning these two training models are centred on two issues; firstly, the legislative and policy frameworks which inform the structure of these two models and secondly, the teaching and learning dynamics at an institutional level.

In essence this discussion is not aimed establishing which of the two is better than the other, rather, the aim is to provide a descriptive account of how competence development is pursued across the two institutions. COMET tools and concepts will be used to provide an empirical means to analyse the various aspects of each training model. The purpose of this process is to gain greater insight into the teaching and learning dynamics within these two TVET institutions and how these dynamics could have shaped learner outcomes during the COMET benchmarking process.

The CBMT programme is the preferred training model for a majority of companies and training providers in the automotive sector (MerSETA, 2009c). In the specific case of SFSA, it consists of four cycles of 45 weeks, at the end of each of these cycles learners submit a portfolio of evidence and sit for a level test. Course content is modularised and learners are assessed on the unit standards covered in the specific cycle. Certificates are awarded upon successful completion of each level of training. The certificates awarded to learners correspond with the relevant NQF level. Upon completing level four learners are then eligible to take their trade test. A trade certificate is awarded at upon the successful completion of the trade test. In terms of the NQF the four levels of the programme range from NQF level 2 – 4

(MerSETA, 2009c; VWSA, 2014b). It must however be clarified that these level certificates are not in themselves qualifications, they merely indicate developmental milestones in the training process which lead up to the qualification. The qualification itself is linked directly to the trade certificate.

The Time-Based Apprenticeship (apprenticeship) model is the model of choice for training providers operating in the manufacturing sector (MerSETA, 2009b). It is a continuous training programme that runs for a minimum of 80 weeks to 4 years. Learners are able to access the apprenticeships with a minimum of an NQF level 3 qualification in any of the occupation related subjects offered by SFSA. The apprenticeship programme is divided into two parts; institutional training and workplace training. MerSETA regulations prescribe a mandatory period of institutional training at the beginning of the apprenticeship programme, this is then followed by workplace learning (MerSETA, 2009b). Once learners have commenced with workplace training their activities are tracked through logbooks which stipulate the types of activities they should cover as well as the duration that should be spent on these activities. After a minimum period of 80 weeks learners can apply to take their trade test. The training programme officially comes to an end once a learner successfully completes the trade test and receives their occupational accreditation (AMSA, 2014; MerSETA, 2009b).

The CBMT and apprenticeship models share many similarities in terms of curriculum, accreditation and outcomes; however the one distinguishing feature between the two is how they are structured. The two models are a contrast of each other in terms of how disciplinary knowledge is organised and sequenced during the course of the training program. Both consist of unit standards that are prescribed and accredited by SAQA as well as curricula endorsed by MerSETA. In the case of the apprenticeship at SFSA, emphasis is placed on the functional aspects of the curriculum. Their aim is to equip learners with the necessary competencies to be work ready by the time they graduate. Theory (disciplinary knowledge) and practice are fragmented from each other as institutional (theoretical) training is offered in the initial six month period of the apprenticeship program thereafter learners are shifted to workshops for simulated training. Thereafter learners are gradually integrated into the workplace and assigned tasks along the production line. The unit standards that make up the qualification are loosely organised and emphasis placed on time spent on occupation related tasks. In contrast the CBMT model at PCSA offers unit standards that are rigidly organised and aimed at providing continuous institutional training simultaneously with simulated workshop training as well as workplace exposure. The emphasis of this model is integrating a

significant theoretical component with a workplace exposure component. This particular model allows PCSA to be more efficient in providing feedback to learners and instructors (AMSA, 2014; VWSA, 2014; MerSETA, 2012). What seems to be clear from the findings is that a significant factor in the development of competence is the structuring of disciplinary knowledge within the training programmes as well as its relationship to the work process. There seems to be a correlation between workplace exposure and the development of holistic competence, vocational curricula encourage which require learners to engage with work processes develop a wider variety of competencies. Thus the efficiency of a TVET curriculum is inhibited or enhanced by its ability to synchronise the sequencing and pacing of its theoretical and applied components.

It is perhaps this distinction in the structure of these two training models that begins to explain the differences in the performance of learners from these institutions in the COMET study. Taking into account the training approaches at both institutions it is not surprising that the outcomes of individual learners were similar across the two institutional groupings. Figure 6 (pg 75) indicates that across both institutions there is a high proportion of learners who have developed competencies related to theoretical knowledge of the subject area. This is clearly exhibited by the fact that in both institutions 70% of learners were ranked at the level of nominal competence. The implication is that learners have a firm grasp of curriculum content at a conceptual or theoretical level, however they are unable to apply this understanding to work processes inherent in their occupational training. This particular trend indicates that learners are able to develop all the necessary competencies albeit separately and struggle to reconcile and consolidate these competencies in the context of the workplace. This further illustrates the disconnect between the various components of the TVET curriculum. However the fact that the CBMT model at PCSA was able to develop a small percentage of learners exhibiting holistic shaping competence indicates that disciplinary practice and disciplinary knowledge need to be brought closer together.

Rauner et al. (2012) argue that these findings are symptomatic of the modularisation of the various curriculum components and how these units of the curriculum are not synchronised as seamlessly as they could be. This line of argument might be accurate in a broad sense however in this instance Allais (2006) and Gamble (2006; 2003) provide more precise insight. They argue that the failure of learners to apply themselves in occupation related tasks can be traced back to the gap between the demands of institutional training and workplace training. Theoretical knowledge is taught and assessed separately from applied or

occupational knowledge. Thus causing a divide between the curriculum applied in TVET classrooms and the training taking place within the workplace. This is mainly attributed to the trend across South Africa's TVET system where TVET institutions across the South African system have little or no interaction with industry. This arguably facilitates the development of TVET curricula which are not aligned to the requirements and standards of their corresponding occupational fields. In other words, what is expected from learners in order to be awarded a qualification is different from what is expected from them for their occupational accreditation and roles. Arguably this type of institutional arrangement may be one of the factors that contribute to the issue of TVET graduates not being technically prepared to enter the workplace. The overall impact of which is a curriculum that has a narrow understanding of vocational education on the development of holistic competence. This is a significant factor as it serves as a barrier which prevents the learner from developing an understanding of the complete work process.

Conclusion

Ultimately the aim of this research was never to argue or insinuate that South Africa's TVET system is not producing candidates with the required competences to enter the labour market. The aim rather was to interrogate the issue beyond the "skills shortage" discourse that most South Africans have become accustomed to. The purpose throughout this dissertation has been to explore the various factors which influence the design and implementation of vocational curricula at the institutional level in South Africa. This is a slightly different approach from that of most studies that have been conducted within the South Africa's TVET sector which have focused primarily on how TVET institutions are not producing graduates with the required skill-set (competencies) to operate effectively and efficiently in the labour market. What this dissertation has attempted to accomplish rather is to frame the competence discourse in a different manner. A manner in which the concept of competence is interrogated at the institutional level, exploring the relationship between curriculum and competence within the teaching and learning space. Instead of approaching the subject of competence development from the perspective of the perceived deficiencies in the competence levels amongst graduates. The approach adopted in this study has been tailored to uncover the processes, factors and dynamics found at the institutional level which shape learners' experiences and ultimately how they develop various competencies. In this regard the various theoretical approaches underpinning the understanding of competence development at the

institutional level have been explored and the potential links between curriculum design and competence development explored.

Conceptually the term competence is quite complex and as a result can lead to various and varied understandings of what the term entails. What can be clearly deduced from the body of literature on the subject is that competence is quite a multifaceted concept with a variety of applications linked to it. From the various perspectives presented in the literature it may be possible for one to argue that when one speaks of competence it is not in reference to a singular attribute or trait. The concept consists rather of a nexus of individual attributes and traits which includes; knowledge, skills, personal and occupational identity as well as being part of a community of practice. Thus it is important to understand the concept of competence within the context in which it is being spoken of or applied. In the context of a TVET system it is critical to have a firm grasp of how competence has been framed and how it influences the design and implementation of the curriculum as well as institutional processes.

What seems to be evident from the literature on the subject is that competence development, curriculum design as well as TVET institutional arrangements are linked to each other at a fundamental level. The type of approach to competence development adopted inevitably influences the structure and the institutions that form part of a TVET system as well as the most ideal curriculum to supplement the system. Whether implicitly or explicitly stated the primary objective of a TVET curriculum (and by extension the role of TVET institutions) is to develop a learner from one level of occupational competence to another. The development of holistic competence requires an effective TVET curriculum which creates strong links between institutional learning and work based learning. This highlights the importance of establishing enabling institutional arrangements, institutions as well as curricula which maintain the integrity of the vocational qualification while it systematically exposes learners to the demands and rigours of the workplace.

TVET institutions provide the contextual backdrop for understanding the relationship between curriculum and competence. As pointed out by the theories of Lave & Wenger (1991) as well as Rauner (2007; 2005) the context within which TVET teaching and learning processes take place is crucial for inculcating the necessary understanding of occupational roles within learners. These theories point out the value of understanding how vocational knowledge is embedded within communities of practice and the importance of being able to access this embedded knowledge. Therefore developing the learning curriculum requires an

identification of the sequence of activities that learners need to engage in order to become active and effective participants within their respective communities of practice.

Ultimately discussions concerning TVET curricula have a bearing on the nature of TVET qualifications. If TVET qualifications (training programmes) are to develop the types of competences that increase the employability of learners, greater emphasis has to be placed on effectively incorporating theoretical, technical and occupational components into their design. The subject of employability of South Africa's TVET learners is gaining more prominence within the policy discourse given the high rates of youth unemployment in the country. The most widely held belief across the labour market being that the TVET qualifications currently are too generic and lack depth when it comes to occupation specific competencies. The recommendation in this regard being that TVET curricula should be developed to make provision for occupation specific skills as well as embedded knowledge (Marock, 2011). The findings of this study seem to suggest that, what is required of a TVET graduate by the labour market is not only an internalisation of theory within the discipline but also how to utilise this knowledge in a professional capacity.

The exercise of benchmarking best practice in curriculum design and implementation across TVET systems is a contested one as curricula are formulated for specific contexts with specific objectives. The challenge with cross-system comparative studies is establishing a valid degree of objectivity and validity. The conceptual framework applied in the construction of the COMET test instruments and methodology makes it possible maintain consistency and validity across systems. Moreover the test instruments allows for a diagnostic overview of competence development within a particular TVET system. South Africa's participation in COMET benchmarking provided useful insights into the curriculum dynamics at different TVET institutions. Given the variety in the types of institutions which participated the findings where consistent across the sample. The high level findings of the COMET study indicate that; a high proportion of learners who participated in the study were only able to attain a nominal level of competence, learners have not developed an understanding of the work process beyond their functional roles, the development of competence seems to stagnate after two years of training and the learners who were able to attain holistic competence receive their training from the same institution.

Building on baseline established by COMET testing this study set out to investigate what institutional factors shape competence development. Two broad questions were asked; firstly,

what are the patterns of achievement of trainee electricians in the COMET test in relation to their training institutions? Under this question there were three sub-questions related to learner performance in the COMET study. On the question of learner performance in the COMET benchmarking assessment, learners were able to attain a nominal level of competence. The significance of this being that a majority of learners were only able to exhibit a theoretical grasp of what was required of them in the assessment but failed to apply themselves beyond this point. This was consistent across the whole sample throughout the various institution types. There were a few learners who attained competence levels beyond the functional level, these learners were all part of PCSA's academy. In the analysis of the findings there were a number of factors cited for this trend in competence attainment, the main culprit however was identified as the curriculum. In this regard it is important to note that it is not the case that South Africa's TVET curriculum is unable to develop competent artisans. However South Africa's TVET curriculum is designed to develop and assess certain competencies, applying a very specific methodology, which do not align completely with those outlined by the COMET framework. The COMET findings do not by any means provide a comprehensive account of TVET in South Africa. Thus for my study the findings of COMET testing have been utilised as a diagnostic framework to identify "ideal" competence, the potential shortcomings in South Africa's curriculum design and uncover processes of implementation at the institutional level.

The second question asks, what influence does the curriculum have on the development of holistic competence? Beyond the statistics and graphs depicting competence levels across the sample what may be discerned from the COMET benchmarking process regarding competence and the curriculum? In order to gain a more comprehensive account of the institutional dynamics the focus was shifted to two of the institutions that participated in COMET, SFSA as well as PCSA. Given that these two institutions follow similar curricula accredited by merSETA. What institutional factors may have led to the competence profiles of their learners to be so different? Further inquiry into these two institutions revealed three significant factors that affect teaching and learning outcomes.

i. The most prominent of these institutional factors is the sequencing and pacing of the curriculum. Learners from PCSA exhibited more holistic competence profiles than their SFSA counterparts due to their curriculum placing emphasis on creating and maintaining a strong link between the classroom and the workplace. The PCSA curriculum is divided into shorter cycles where learner progress can be assessed

regularly and learners are constantly moving between the workplace and the classroom. This is in contrast to SFSA that provides theoretical training only in the first part of their training program to be followed by a long period of workplace exposure. Their curriculum treats theoretical and applied components as being distinct from each other. The shorter training cycles at PCSA allow for maximum retention of new knowledge and allows learners to build on knowledge gained in the previous training cycle. The challenge at SFSA is organising the curriculum once the learner has completed the theoretical phase, practical tasks are not organised in a way that relates to the flow of theoretical tasks.

ii. The second influential institutional factor observed was the level of synergy between the theoretical and practical components of the curriculum. This was another area of teaching and learning where the two institutions differed in approach. Both institutions have a significant proportion of practical and workplace training aspect as part of their programs, however they differ in how this aspect is incorporated into the institutional training. The PCSA model with its four 45 week cycles increase the level of workplace exposure incrementally across the cycles, beginning at 20% in the first cycle and ending up on 75% before the learner graduates. The development of holistic competence is continuously reinforced by the close links between the classroom and the workplace. On the other hand the SFSA model takes a slightly different approach where all the institutional training takes place in the initial period of training, thereafter learners work in a simulated environment until their second year of training when they start with their workplace exposure. As theory and practice are kept separate from each other there are limited opportunities for theoretical and applied knowledge to interact. This could appear to be a coincidental and inconsequential occurrence however as most scholars TVET have noted vocational curricula are stronger if they can balance the demands of the workplace with the rigours of the classroom.

iii. The third institutional factor observed was existence of an institutional culture and a well-established community of practise. This is the one common factor across both institutions, since both institutions are linked to companies learners are constantly in contact with individuals practicing in the occupation they might be training for. This distinguishes learners training at SFSA and PCSA from those who are training at

other types of institutions. The culture created at these institutions by those who are already in the workforce makes it possible for the learners to conceptualise their occupational identities in a realistic manner. Although no direct links between the development holistic competence and organisational culture have been empirically proven the trends in a number of TVET studies (Allais, 2011; Rauner, 2007) strongly suggest that the relationship between the two is quite significant.

Overall TVET curricula on their own play a limited role in the development and transfer of occupational competencies. Fundamentally a TVET curriculum by design is required to balance the tension that exists between institutional benchmarks as well as workplace demands. In order for the curriculum to be effective in facilitating the development of vocational learners it needs to be enhanced by institutional approaches that bridge the gap between the workplace and the classroom for learners. At the policy level there may be grounds to review how competence is defined curriculum statements for TVET. There is also a need for longitudinal studies exploring TVET institutions in more depth focusing on; teaching and learning processes, curriculum content, synergy between classroom and workplaces. As much as the COMET study did not make any pronouncements regarding institutional dynamics it did provide critical clues regarding the potential shortcomings of institutional approaches to TVET.

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Appendix

Appendix A: Training Institution Questionnaire

Instructions

- Space has been provided for you to fill in your answers directly into the table, the table is extendable so feel free to express yourself.
- I kindly request that where possible please answer in as much detail as you can.
- Email the completed questionnaire to znzungu@yahoo.com

1. How would you describe your training approach?
2. What do you look for when assessing a trainee at the entry level of a training program?
3. How do you ensure that your trainees are integrated into the workplace environment?
4. Describe the stages that your trainees go through during the training process.
5. How much exposure do trainees have to production related tasks?
6. What role do mentors (supervisors) play in the training process?
7. Outside the classroom do you have a student support system? Please describe.

8. **Besides technical abilities are there any specific skills that you look for in a trainee? What are they?**
9. **Do you retain all your trainees upon completion?**
10. **If no; how do you choose which ones to retain?**
11. **What measures do you have in place to ensure that trainees maintain a balance between work and learning demands?**
12. **What would you say distinguishes the training that your trainees receive at this institution from training programmes offered in other institutions?**
13. **How do you measure the success/failure of your training programmes?**
14. **Outside of employment in your company are there any career (or study) opportunities open to your trainees upon completion?**
15. **What kind of individuals are you looking to produce by the end of the training program?**

Appendix B: Cover Letter

My name is Zolile Zungu (student number 207507377) and I am currently conducting research towards a Master in Education degree at the University of KwaZulu-Natal (UKZN). My research is investigating the relationship between curriculum and competence development within TVET. You have been selected as a participant in this study because of your expertise in the field of TVET as well as the role you play at your training institution. Your participation in this study requires you to answer some questions related to the training processes that are followed at your training institution. Please note that you may be contacted for a follow up interview to clarify specific issues if the need should arise. The information you provide will then be compiled and submitted to UKZN towards the completion my thesis. Please note that participation in the study is completely voluntary and you can decline participation or pull out of the study at any stage.

Thank you for your time and assistance it is greatly appreciated. For any queries regarding the research you can contact myself on 0795700183 or znzungu@yahoo.com. You can also alternatively contact my supervisor Prof. Volker Wedekind on 0836803696 or wedekind@ukzn.ac.za.

Appendix C: MerSETA Permission Letter

merSETA
MANUFACTURING, ENGINEERING AND RELATED SERVICES SETA

Mr. Zolile Zungu (Student number 207507377 at the University of KwaZulu-Natal)
61 Njord Rd,
Oribi,
Pietermaritzburg, 3201

24th January 2013

Re: Permission to use COMET data

This letter serves to confirm that the Manufacturing, Engineering and Related Services SETA (MerSETA) has granted you the permission to make use of the data from the South African edition of the COMET 2012 pilot study. Access has been granted to the raw data as well as the final report. Please note that the merSETA holds the intellectual property rights to all matters related to COMET in South Africa.
Permission has been granted with the following conditions;

- The names of Universities, TVET Colleges, Companies and Individuals who participated in the COMET study are to be kept anonymous throughout any write-ups, this includes the thesis or any papers that may be published from it.
- The MerSETA reserves the right to revoke permission to use this COMET related material should the write-ups not meet the above condition.

The merSETA supports development of TVET in South Africa, particularly the capacity of new Knowledge workers and researchers in the field of vocational competence development studies. It is our pleasure to partner with you on your research project.

Further enquiries can be made to the writer on hbrown@merseta.org.za

Sincerely

Helen Brown
Senior Manager: Strategy & Research

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